UNITED STATES ARMY DECEMBER 1971

AVIATION DIGEST

depend on you

UNITED STATES ARMY AVIATION DIGEST

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ABOUT THE COVER

Happy holidays depend on your ability to take safety seriously. Of course you can laugh it off, but you won't be laughing last

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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UNITED STATES ARMY

AVIATION DIGEST

1. DO YOU FEEL THAT INCENTIVE TO WRITE FOR THE DIGEST IS HELPED BY THE ANNUAL AND MONTHLY CASH AWARDS? _ _ _ _ _

2. HAS THE MONTHLY AND ANNUAL CASH AWARDS EVER PROMPTED YOU OR SOMEONE YOU KNOW TO WRITE FOR THE AVIATION DIGEST? _ _ _ _ _ _ _ _ _ _

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ATC		
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4. DO YOU FEEL THAT THE ANNUAL AND MONTHLY CASH AWARDS SHOULD BE CONTINUED? _ _ _ _ _ _ _ _ _

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	YES	NO
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JUST RIGHT		

6. WHAT SUGGESTIONS OR IMPROVEMENTS WOULD YOU SUBMIT FOR THE ANNUAL AND MONTHLY CASH INCENTIVE AWARDS PROGRAM?

7. MY RANK IS: _ _ _ _ _ _ _ _ _ _ _ _

8. MY RELATION TO ARMY AVIATION IS: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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Mission: Possible

Captain Thomas P. Petullo

ANNUAL AWARD Monthly Winner CONTEST

GOOD MORNING, captain. Last week an economic dispute in a small republic precipitated a strike by indigenous personnel. This uprising has caused a shortage of instructors in the Army's flight training program. Your mission, captain, should you *decide* to accept it, is to aid in filling this shortage by attending the methods of instruction course and becoming a basic instrument helicopter flight instructor at the U. S. Army Aviation School which is located at Ft. Rucker, Ala. As usual, if you decide not to accept this assignment, you will enter ground resonance and self-destruct in 5 seconds.

Good luck, captain.

BASIC INSTRUMENTS! EMERGENCY PANEL . . . I shuddered as I remembered my training and classmates during the basic instrument phase. We were all felons of flight who should have been grounded purely from an ecological standpoint. But before long, I reported to Hanchey Army Heliport at Ft. Rucker for my basic instrument MOI course.

Three weeks later I arrived at Ft. Rucker's Shell Army Heliport to confront, once again, my ancient nemesis. I'm sure all IPs remember their first teaching cycle as a difficult period of adjustment. After I had finished a

few classes my confidence increased and I began, sophomorically, to approach the art of instruction by cataloging the most frequent errors I encountered and attributing these to a mythical Four Horsemen of the Apocalypse: Inspector Clouseau, Zero, The Artful Dodger and Kamikaze.

The first horseman is Inspector Clouseau. Timid, nervous, sweaty palms and carrying a large pillow, he approaches the aircraft. While you are checking the dash 12 he gets a fuel jar to drain the aircraft. Next you hear . . . THUD . . . CRUNCH . . . CRASH, as, tripping over the skid, he puts his elbow through the chin bubble and drops the fuel jar on the asphalt.

After you get strapped into the replacement aircraft Inspector Clouseau attempts to tune the radios with his nav switch down. Knowingly, you keep your nav switch down waiting for him to turn the volume all the way up as he has done every day for the last week. With the volume so high that you can hear the radio even with you nav switch down you wait for him to say, "Sir, I can't get the ADF."

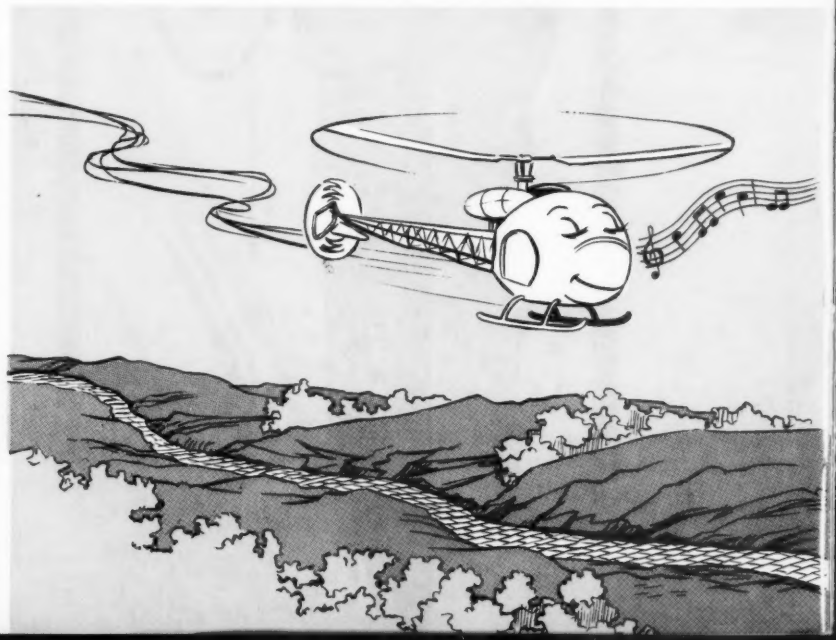
With "the Devil-made-me-do-it" innocence you reply, "Oh, you forgot to put your nav switch up."

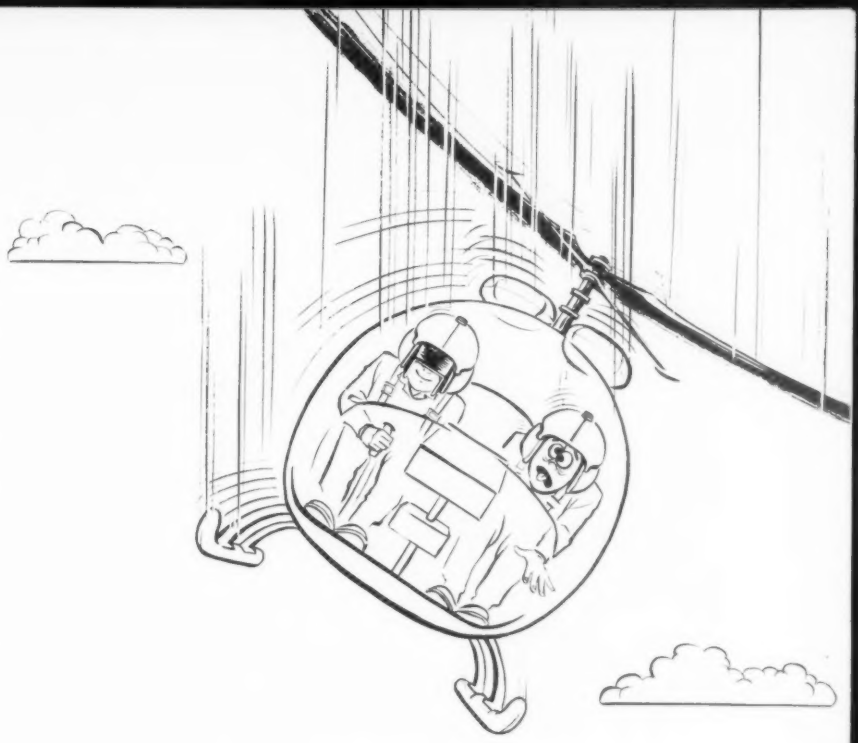
He reaches over and flips his nav switch up. After he uncrosses his eyes he turns the volume down. Next, you watch as he attempts to perform his ILS check. Hesitantly, he gropes his way to the UHF radio and starts twisting the dial. You wait, patiently, for the inevitable, "Sir, there are no one's on this radio, only two's and three's."

You sigh and handcarry him to the ILS. You received a premonition of Clouseau's flight performance when, with trepidation, you opened his flight records and there stenciled across his Link card was the warning: *student gets vertigo while Link is still in straps!*

The second horseman, Zero, operates according to the inexorable law of inertia, which states, "When one of the factors of a product is 0, the product itself is 0." You have to wave your hand in front of Zero's face to ensure his circuit breaker is still in. You watch him fly straight and level as, zombie-like, he vacantly stares at the instrument panel.

The perversity of human nature is exquisitely demonstrated by Zero. You give the aircraft to him, tell him to maintain 2,000 feet, 60 knots and a 270-degree heading. Zero will hold 2,000 feet, 60 knots and 260 degrees for 5 minutes. Finally, you acquiesce and place the heading indicator's chevron over 260 degrees, and what heading do you think he holds? Right, 270 degrees.





Because of anticipation, you have to sneak up on Zero with all maneuvers. He'll have been flying perfectly straight and level for 10 minutes and you tell him to start X maneuver when the clock's second had is on 12. By the time the second hand reaches 12 you are trying to recover from an unusual attitude. Frustrated, you have an irresistible temptation to unplug his helmet cord and garrote him with it. Once on partial panel you vertigo your way through the sky, following the yellow brick road as strains of "We're off to see the Wizard . . ." reel off in the background.

The third horseman, The Artful Dodger, spends 90 percent of his time and energy rationalizing why he has difficulty flying, until some IP unwittingly gives him the panacea for all his problems: "You have a built-in right hand turn."

Aha! Dodger pounces on this little morsel with glee. He is the victim of a quirk of nature. When he was born, the clouds parted and a voice, booming with authority, decreed, *Thou shalt have a built-in right hand turn!* And now, Dodger greets you on the first training day with the ominous pronouncement, "I want to make one thing perfectly clear—I have a built-in right hand turn."

A second ploy of Dodger's is thermals. It can be the calmest of days and Dodger will be in an 800-foot rate of descent at 20 knots and 10 inches of manifold pressure exclaiming, "Wow! These thermals are really something, aren't they?" They sure are.

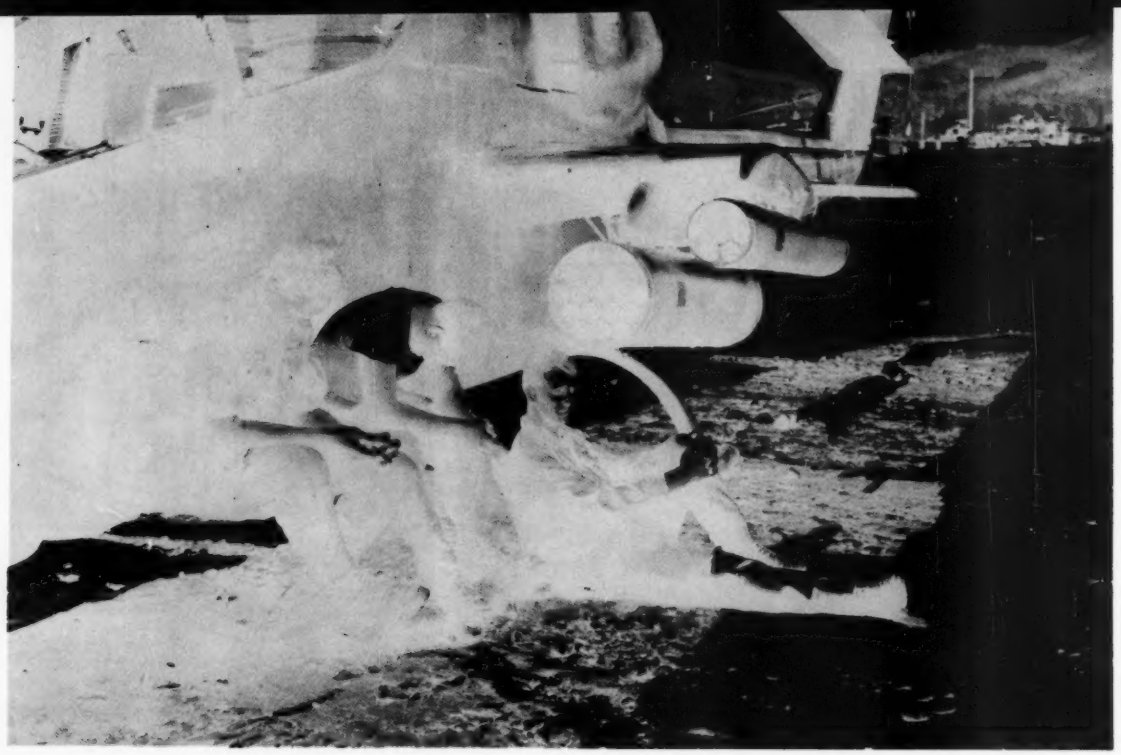
The fourth and final horseman is Kamikaze. Does the name give you any ideas? Right, you know he's out to get you. He's so nervous and overcontrols the aircraft to such an extent that at any moment you expect him to make a "Foam the runway, my FM's inop!" call. Any unusual attitude you give him ends up in a screaming gunrun, the blades flexing, wop . . . wop . . . wop . . . as you frantically try to recover the aircraft. His ITOs are poetry in motion as, with the collective buried in his armpit, the aircraft springs 15 feet into the air and then sluggishly starts settling back onto the panel—the rpm sucked down to 2800.

Kamikaze's piece de resistance, however, is the forced landing. He thinks that trim is something you get in a barber shop. When you retard the throttle the aircraft yaws 90 degrees to the left which does wonders for your flow of adrenalin. Having open areas on three sides you watch as he turns 180 degrees and homes to the woods. Naturally, on recovery the engine starts coughing in unison with your heart.

I went along "classifying" students for a short while, deluding myself with this mental legerdemain, until one day I read in one of the Weekly Summary's well dones: "Flying on a visual reconnaissance in the RVN at a low altitude, his helicopter was hit by small arms fire. A round shattered the tail rotor servo, severing an engine oil line. The tail rotor failed in a fixed left position and loss of hydraulic fluid and oil occurred. The pilot flew to his base and landed with no further damage." Recalibrating my eyeballs, I looked again at the aviator's name. Zero! It couldn't be! Not my Zero, who flew with his eyes bloused, and thought thermals were something you wore in cold weather.

Two weeks later I received my second shock . . . a double one. Both Clouseau and Kamikaze received broken wing awards. Clouseau for making a successful autorotation on a 35 degree slope, and Kamikaze for making a successful autorotation when his engine failed in formation flight over a heavily wooded

Continued on page 25



Twelve Cardinal Rules

WITH AN UNEVENTFUL morning and no need to rearm, the AH-1G HueyCobras sat awaiting their afternoon mission.

At 1200 hours the Cobra team departed their base helipad for an afternoon reconnaissance. A 20-minute flight brought the fire team into the assigned area of operations. The team leader initiated a circling pattern to perform a high reconnaissance. Upon completing this high recon he decided that everything looked quiet. The team leader started a descent; his wingman stayed at 1,500 feet to cover him.

Reaching his desired contour altitude, the lead ship started a systematic reconnaissance of the slopes of the specified hill. He noted that the hill was covered with dense vegetation, making it difficult to see the ground. Continuing his survey and slowing his air speed, he suddenly spotted numerous enemy bunkers and fighting positions. In one particular area near the base of the hill he found several large bunkers and five very cleverly camouflaged buildings with aluminum roofing.

The fire team leader decided that he had found an appropriate target for the afternoon air strike, so he climbed to altitude and contacted long range reconnaissance patrol (LRRP) control. The team leader was told that the planned air strike had been canceled and that he should use his own fire team to neutralize the target.

Since the enemy had skillfully camouflaged the area, it was difficult to locate the targets from altitude. Thus, the team's leader decided that he could obtain the best results by making his initial firing runs from a low altitude where target identification would be easier.

Calling his wingman he explained the type of attack pattern planned and the direction of attack to be used. Then again leaving his wingman to cover him the team leader descended to 500 feet above ground level. His plan was to make two quick rocket runs in an attempt to mark the target as closely as possible. After marking the target he planned to break off while his wingman rolled in to cover him, and then he'd climb out to enter a normal racetrack pattern.

Lead maneuvered into position and rolled in for his first run. He lost sight of the target in the dense jungle foliage and had to break the run. On his second

try lead had better luck and scored hits on two bunkers and one hootch. Thus far he had received no enemy fire nor had he seen signs of any enemy troops.

The fire team leader decided that to sufficiently mark the target one more run would be necessary before climbing out for the high altitude attacks. Turning inbound, he started his third firing pass. Flying parallel to the hill he fired at the base of the target area. Halfway through the run the gunner was excitedly saying that the rockets were looking good—right on target.

As the aircraft commander (AC) punched off his fourth pair of rockets the enemy opened fire from numerous bunkers located closer to the top of the hill. Their rounds hit the canopy to the right front of the AC and the canopy exploded sending minute particles of splintered plexiglass into the face of the AC. The pilot made a quick call, "Lead is taking fire, I'm hit!" The covering wingship instantly rolled in pouring rockets and devastating minigun fire onto the enemy position, while the pilot-gunner of the lead ship took control from his wounded AC and flew it clear of the hostile fire. After suppressing the enemy positions the wingman took up his normal position behind the lead aircraft and escorted him to safety.

Just another war story? Yes. In this particular incident the pilots were extremely lucky. The team leader suffered temporary eye damage and his aircraft incurred minor damage. What can we learn from this incident? The mistakes that were made were not only obvious but also very common and are still being made in the Republic of Vietnam today. The following errors are typical examples:

- *Flying parallel to a prominent terrain feature.* The rule not only applies to hills but also to tree lines, rice dikes, roads and streams.
- *Intermediate altitude attack patterns.* At times low level, nap-of-the-earth flight is a necessity—to avoid large caliber or sophisticated air defense weapons or, as in this example, to acquire a target. The mistake is in choosing an intermediate attack altitude. When air defense is not a problem there are two available options in reducing vulnerability to small arms fire: the rule is to either fly high—at least 1,500 feet above ground level—or fly at treetop height so as to present a fleeting target to the enemy. To commence an attack from an intermediate altitude such as 500 feet is to invite trouble.
- Flying the same attack pattern three times in a row. This mistake enabled the enemy to plan exactly when and where he would take the aircraft under fire.

All three of these broken rules are part of the twelve cardinal rules of gunship tactics. The following rules will keep you reasonably safe while still enabling you to accomplish your mission:

I—Identify the friendlies.
II—Avoid overflying the target.
III—Avoid the deadman's zone.
IV—Avoid the 180-degree position.
V—When possible use a high recon.
VI—Always assume the area is hot.
VII—Avoid flying parallel to terrain features.
VIII—Avoid flying and firing over the heads of friendlies.
IX—Expend only on worthwhile targets.
X—Know the situation.
XI—Brief everyone.
XII—Take your time.

Knowing these rules is one thing; using them is another. As is the case with all rules, they are worthless if not followed. Remember the rules and obey them.

CAUGHT IN THE FISHHOOK

CW2 James E. Staigle

IT WAS ONE of those days; monsoon rains, cold winds and fog thick as pea soup. The place: LZ English, the Republic of Vietnam, home of the 173rd Airborne Brigade. LZ English is located about 30 minutes north of Phu Cat Air Force Base as the UH-1 Huey flies. English is not the standard run-of-the-mill landing zone. In fact, it is comparable in size to one of the smaller camps in Vietnam, unlike other normally small landing zones.

English made quite a nice target for Charlie because it was situated only a couple of miles away from some pretty rugged mountains to the east. Enemy activity in the area had been picking up because English had been getting hit fairly often. The Third Brigade, Fourth Infantry Division had been sent to LZ English to clean up the area and brought along its LRP. For those who don't know, LRP is short for long range patrol—a group of men specially trained for scouting missions.

Two new LZs had been put in the valley on the other side of the mountains to the east due to increased enemy activity. Blackjack 21 and his wingman had been called on to do most of the lift work for the LRP, carrying it from place to place while it was based at LZ English. Blackjack 21 ferried the LRP team to and from the dropoff point called the Fishhook. The upper portion of the An Loa Valley curves south again making the area look like a fishhook, thus its name.

The patrol had been in the area about 2 days and hadn't seen much activity. At about 0900 hours a call had been relayed from one of the LZs in the An Lao Valley that the patrol had something. Everyone was listening to the radio monitoring the frequency for more information. About 30 minutes later a call had come in from LZ Tape, near the mouth of the Fishhook, saying that the patrol had engaged a North Vietnamese Army (NVA) patrol in a firefight.

The LRP team requested assistance as it had nearly depleted its ammunition supply and had spotted another NVA patrol coming down the trail. With the weather so bad most of the aircraft had been grounded at various locations and were unable to take off again. The only helicopter available was the OH-6A belonging to the artillery battalion of the Third Brigade. The LRP leader who had monitored the call requested the artillery commander to use his aircraft and its pilot to get some ammunition to his men. The artillery commander agreed if the pilot would fly the mission with the weather so bad.

The team leader found the pilot talking to his crew chief about the maintenance on the aircraft and filled him in on the

details of the situation. The pilot glanced at the bad weather and replied, "Well sir, all we can do is try."

The LRP team leader rounded up the much-needed ammunition, an extra observer and two CAR-15 rifles as the aircraft has no armament of its own.

As they loaded the OH-6 and proceeded to take off, the pilot noticed the fog was lifting a little. Having received a special clearance from the control tower to depart, the aircraft lifted off from LZ English. The pilot could see that most of the flight to the An Lao Valley would be at a low level, and he realized the river would be the only route they would be able to follow to the valley. He then radioed ahead to two fire bases checking the weather conditions ahead of them.

The first fire base at the southern end of the valley reported the fog was slowly beginning to lift, but it looked worse to the north. The second fire base to the north gloomily confirmed this report. In the meantime the pilot was flying as low and as fast as possible to avoid ground-to-air fire.

As the aircraft flew over the first fire base the crew noticed the ceiling had improved but was much lower to the north. When the OH-6 passed the second fire base the ceiling started to drop. The pilot told the LRP team leader that if the ceiling dropped any lower they would have to turn back. A couple of seconds later they received a radio call that the patrol was down to its last full clip of ammunition. They were also told that most of the second NVA patrol had run back into the hills, but they believed that they had trapped a prisoner or two in the tall grass.

The pilot called ahead to the second fire base requesting that it radio the patrol that they were trying to get through with more ammunition and assistance and to be watching and listening for the helicopter.

The ceiling looked higher on the eastern side of the fire base, so the pilot elected to leave the river route and fly to the east of it hoping to join the river again farther to the north. All three of the men onboard kept watch for anything unexpected to happen as they were now rapidly approaching the Fishhook area. The pilot radioed back to the second fire base that the weather was improving, and that if they would have the recovery aircraft and gunships follow them up the river they shouldn't have too much trouble.

As the pilot proceeded into the Fishhook area he radioed the patrol asking if it could hear or see him yet. The patrol replied that it could hear him but could not see him.

"Wait one!" the pilot replied, as he came around a corner of the valley, and asked again if the ship was visible.

"Yes," came the reply, "you'll be over us in a couple of seconds."

The pilot's two observers scanned the area and shortly stated, "There they are!"

Half the LRP team was on a ridgeline while the other half crossed the river about 150 feet below them. They were preparing to search through the dead NVA soldiers and their rucksacks for intelligence information. The pilot dropped a fresh supply of ammunition to both halves of the team and advised that he would provide cover while the LRP team searched the area. Since both halves of the team had radios communication would be no problem if anything developed.

As the second half of the team proceeded across the river and up the trail the pilot radioed that there was something fishy about the last body up the trail. His head appeared to be in some kind of a sack and his right hand was inside his shirt. As the helicopter circled about 30 feet over it the patrol cautiously moved up on the body with its head covered. Suddenly there was a burst of fire so the pilot called down to see what had happened. The patrol called back that the NVA with his head covered had been watching through his sack as the patrol approached him and had pulled a grenade on them when they had gotten within a few feet . . . and *thanks*.

The patrol on the trail picked up what it needed and were returning to cross the river when the pilot received a call from Blackjack 21. He said he had a gunship escort if needed and would be there in about 15 minutes. The pilot of the LOH called back that everything seemed under control at this time.

As the LOH pilot flew over the grass at a high hover an NVA soldier popped into view and raised his hands over his head. The observers covered him while the men on the trail moved in on him slowly. They came up behind the NVA soldier and searched him, but found nothing. The pilot set his aircraft down while they tied him and put him in the back seat with one of the observers. The patrol moved back to the river as Blackjack 21 flew overhead.

The LRP on the river and ridge popped smoke grenades to be picked up. After the pickup the LOH, Blackjack 21 and the gunship escort joined up and headed back to LZ English while one NVA soldier wondered how he got into such a mess. I guess he'd never heard that song about Army aviation being there.

Charlie and Danny's Write-In

Dear Danny: I have noticed in several places in TM 55-1510-209-10/1 dated 19 June 71, references are made to the autoignition system in the U-21. I am unable to find a description of this system, how it works or what it does anywhere in the book. Would you send me a brief write-up on this system or advise where the information can be found.

CW3 R. E. S.

Danny's answer: The information you are requesting was inadvertantly omitted from the dash 10 at printing. The following will be included in change 1 at a later date. In the meantime, very briefly, here's how it works:

The autoignition system will be found on the U-21G (U-21A, configuration 2). If used it will automatically reignite the combustion of either engine in the event of accidental flameout. The system is not essential to normal operation and is used during takeoff, landing and flight during icing conditions only. The autoignition system is triggered from a readiness state to an action state when engine torque drops below 410 ft. lbs. Appropriate lights depicting states of readiness, and switches are provided.

★ ★ ★

Dear Danny: When new U-21 pilots report to our unit they are given a checkride by a unit IP before assuming their duties as copilots. Sometime during this ride they are given simulated engine-out practice by the IP by turning off the fuel fire wall shutoff valve. One of our most recent arrivals complained about this practice saying, "We were warned at the school not to do this because it was hard on the engine." Please check with the U-21 people at the school and if this is not good practice, please publish in the Charlie and Danny Write-In so that others may benefit.

CPT J. T. T.

Danny's answer: On the surface, CPT J. T. T., the practice of using the fire wall valve to shut down an engine seemed like a real good gimmick to pull on a new pilot. But after checking with the "experts" I found out two things:

- **By shutting off the fuel fire wall valve you don't "simulate" an engine-out condition, man, you have had a real one.**
- **This practice has been discontinued at the school and is not recommended by the Beech people. The lack of cooling fuel to the gear driven, high pressure fuel pump causes it to cavitate and on two occasions has caused internal breakdown with the resulting "trash" going on into the fuel control. Needless to say this is costly. As the result of your letter changes are being made to all U-21 dash 10s with the notation to use this valve only in an actual emergency.**

★ ★ ★

Dear Danny: While looking through the CH-54B dash 10, TM 55-1520-217-10/2, I find that on page 3-14, paragraph 3-46, item 6, it reads: "Flight control servo interlock—CHECK. (Flight control servo switch 2nd STAGE—OFF position.) Check that 2nd stage pressure will not drop to zero until 1st stage pressure reaches 2000+75 PSI."

It seems to me that since 1st stage servo pressure is already present when the rotor brake is released the references referring to 1st stage should read 2nd stage, and those referring to 2nd stage should read 1st stage. Am I confused?

CW2 C. H. B.

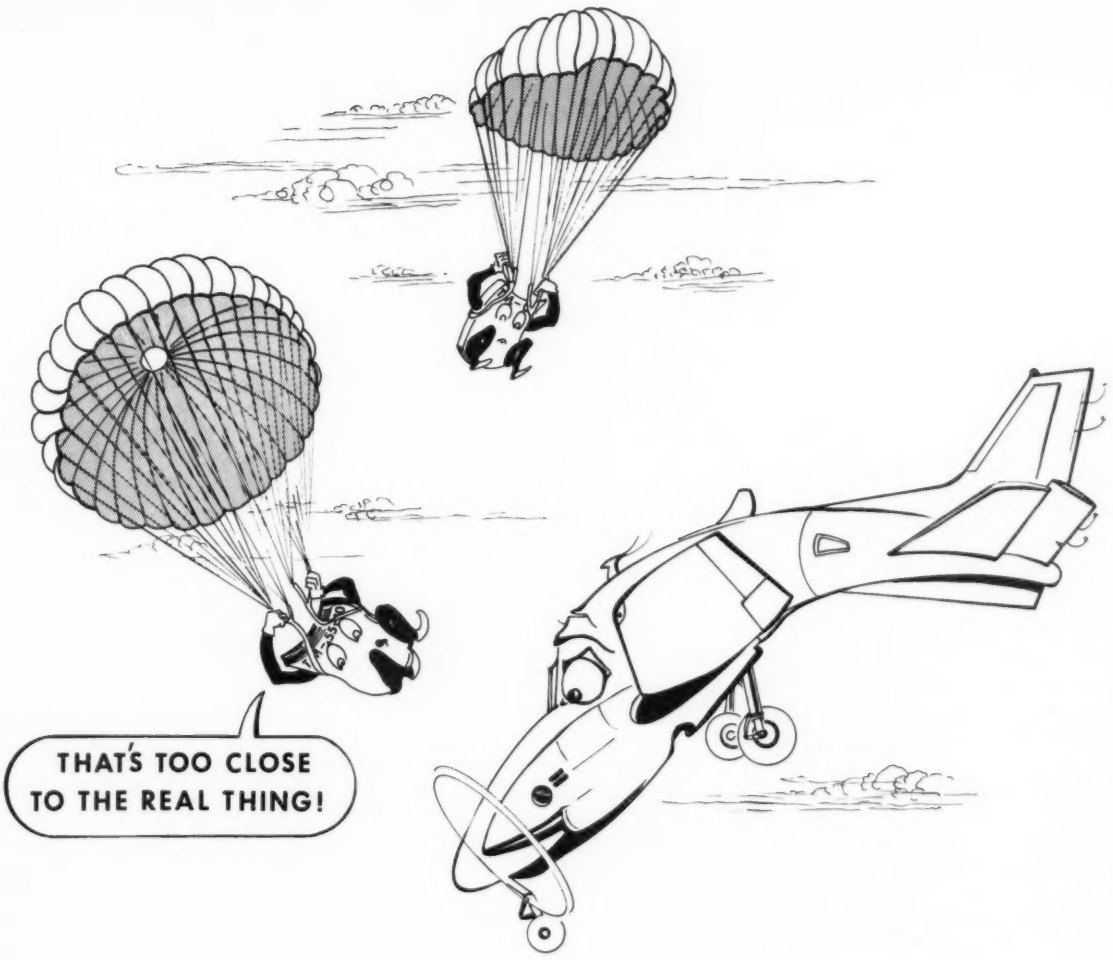
Danny's answer: No sir, you are on the right road. In fact, we recently received a DA Form 2028 from the 291st Transportation Company at Ft. Sill, Okla., on the same subject and are recommending the following changes be made:

TM 55-1520-217-10/2, page 3-14, paragraph 3-46 (*6)

***6. Flight control servo interlock—CHECK.**

a. Flight control servo switch 1st STAGE—OFF.

(1) 1st STAGE servo pressure indicator—



★ ★ ★ ★

ZERO PSI (only after 2nd stage servo pressure indicator reaches 2000+75 PSI will the 1st stage indicate zero).

(2) 1st STAGE SERVO PRESS and 1st STAGE SERVO caution lights—check illumination.

(3) 1st STAGE SERVO switch—centered (ON).

(4) 1st STAGE SERVO caution lights—OUT (when 1st stage pressure reaches 2000+75 PSI).

b. 2nd STAGE SERVO switch—OFF.

(1) 2nd STAGE SERVO pressure indicator—ZERO PSI.

(2) 2nd STAGE SERVO PRESS and 2nd STAGE SERVO caution lights—check illumination.

(3) 2nd STAGE SERVO switch—centered (ON).

(4) 2nd STAGE SERVO caution lights—OUT (when 2nd stage pressure reaches 2000+75 PSI).

Hope this lets the sunshine through.

Tac Tickets And Cream Puffs

Captain Ronald Gibes

IT WAS ABOUT 1600 hours on one of those unseasonably warm and wet afternoons as the new instructor pilot (IP) parked in the north forty prior to his first night training flight. Leaving his car he noticed that the light rain had stopped and there were only two fluffy clouds to the north, looking about as dangerous as huge cream puffs. During the flight commander's briefing weather was mentioned as looking good and reported as 2,000 scattered. There was still an hour of daylight left as the IP and his two fledglings left the briefing room.

After a checklist preflight and runup they received clearance and took off. The light rain started to fall again enroute to Matteson Range at the U. S. Army Aviation School, Ft. Rucker, Ala. There was a slightly lower ceiling near Steepshead, but again visibility was good so "no sweat."

Following a maintenance delay on the line, the new IP took off to fire his first table. On the first pass he noticed his ground speed pick up due to a tailwind. After the second pass he pulled up and suddenly the UH-1B began to climb and shake violently in the turbulence. Forward pressure on the cyclic failed to stop the climb which was now at over 800 feet per minute, and lowering the collective didn't help. The aircraft was now in the clouds with heavy rain washing across the windshield and into the cockpit. The Huey continued to rise, suddenly leveled and then plummeted downward at over 1,000 feet per minute, no control movements could stop its descent.

Suddenly the aircraft was flung clear of the clouds and control was regained. A light rain was still falling as he recognized the lights of Lowe AAF ahead. After a 180-degree turn he found Matteson and quickly landed, palms sweating from the wild ride and puzzling over what had caused the frightening experience.

What had happened was that one of those innocent appearing clouds was maturing rapidly into a thunderstorm. The warm temperature had created lifting air which extended the clouds to a higher altitude where moisture was condensed into large droplets. Tremendous air currents kept the dreary rain inside the cloud with only the harmless appearing light rain falling outside.

Lucky? Sure he was, but he remembered a few basic instrument procedures which kept the aircraft in a level attitude:

- Reduce power.
- Reduce air speed.
- Maintain wings level on the attitude indicator.

Then with luck you may be able to ride it out in one piece.

Now that we know what can be done if severe turbulence is encountered let's see if we can recognize a potential hazard and *avoid* the whole thing.

The interior of a thunderstorm becomes a maze of updrafts and downdrafts as moisture turns to raindrops and heat exchanges take place. Updraft speed increases with altitude and may reach a rate of 3,000 feet or more per minute. Downdrafts originate in the middle levels of the cloud and their velocity diminishes as they approach the ground. Still they may reach 2,500 feet per minute. When downdrafts approach the surface they spread out horizontally producing strong and gusty winds that can extend 15 to 20 miles.

In addition to violent winds and rain thunderstorms may also contain supercooled vapor which can produce dangerous icing in a matter of minutes, as well as snow and hail. Lightning may also be present although strikes are rare and the damage caused is usually minor. Sudden bursts of light can cause temporary blindness and contribute to vertigo however.

Thunderstorms can occur in the morning but most often develop in the afternoon and evening.

A typical thunderstorm has a width and height of about 6 miles, with a lifespan of from 20 to 90 minutes. Movement occurs at a rate slightly less than the prevailing wind. The Environmental Services Agency states that the heaviest concentration of storms is in central Florida, with a rate of 90 to 100 storms per year. In the Ft. Rucker area one can expect 70 to 80 storms per year; this rate points out the need for caution the year round.

Regardless of how well an aviator knows his own region and its weather peculiarities, a complete briefing before all flights is a basic safety precaution. Reports of fronts and line squalls even 50 miles away should be analyzed carefully. Strong winds are not seen underneath storm clouds and can carry a helicopter well above its service ceiling. Unless there is a 20-mile space between storms flights between thunderheads can be very hazardous.

The innocent-looking cloud may look like a cream puff, but don't be fooled by appearances. Keep your distance! If you notice rapidly lowering ceilings or high quality winds land as soon as possible. It may save you from an embarrassing situation and/or sweaty palms.

Aeromedic

FOR FEAR OF THE FLIGHT SURGEON

Major Nicholas E. Barreca, M. D.

The flight surgeon is not the grounding ogre imagined by the air crewman, but the guardian of flying careers and safety

Provided by the Society of U. S. Army Flight Surgeons

TRADITIONALLY, the flight surgeon is looked upon with some suspicion by air crewmen. He seems to represent some interminable threat. He first confronts you at your initial flying physical, then annually thereafter. Each time he seemingly becomes more inquiring . . . How do you feel? . . . Have you had any difficulty since your last physical? . . . Accidents? . . . Hospitalizations? . . . Any convulsions? . . . Unconsciousness? . . . Dizziness? . . . Fainting? . . . Motion sickness? . . . Vertigo? . . . Allergy?

Why all this concern? Unfortunately, through misunderstanding, a very unpopular image of the "fright scourgeon" has been created in the past. He has been considered as somewhat of an ogre, an obstacle to the pursuit of flying, whose sole purpose and goal in life is to ground air crewmen. If he didn't get you at routine health or sick-call examinations, he pursued you to the site of your infrequent but life threatening and most embarrassing aircraft accident.

Much of this folklore and inappropriate imagery resulted from a most evident and painful threat to one's flight pay. This threat, while no longer real, seems apparent to many. Is there any real basis for this fear? In the early sixties, there may have been. Groundings were rapidly followed by suspensions and there were few provisions in the finance regulations to permit continued flight pay. This is no longer the case! Today you and the flight surgeon have many administrative advantages which permit you to receive adequate medical care and flying pay while the flight sur-

geon pursues necessary medical evaluation and treatment.

Let's look at some of these administrative provisions. First, there is the medical restriction. This is the paper procedure by which the flight surgeon recommends that you be *temporarily* "grounded." (Remember the flight surgeon only recommends, it is your commander who imposes the medical restriction by his authority.) However, while on a medical restriction the air crewman may *continue* to receive flying pay, providing he meets the criteria explained below. The medical restriction may be imposed by the local commander for a period up to 6 months before suspension by higher headquarters becomes necessary. During this 6-month period the flight surgeon has more than adequate time to evaluate and treat most illnesses or injuries without interfering with flying pay eligibility.

The modern finance regulation is the cornerstone upon which this less encumbered medical system is enabled to function smoothly. First there is the flight time accrual provision whereby the air crewman may apply time flown in 1 month to the next succeeding 5 months (providing it was not required for the month in question or previous months). Then there is the 3 months grace period which permits the air crewman to apply excess flight time back 2 months from the month in which he is flying. Finally, there is the 90-day flight excusal for those involved in bona fide aviation accidents. All these provisions make it likely that the hard working, conscientious air crewman will receive flying pay despite medical restriction.

Now that we've dispelled that threat to your flying pay, what about that lingering distrust of the flight surgeon? What are his goals anyway? Basically, the flight surgeon aims to prevent all illness, injury or incapacity. His utopian dream would encompass never having to inject another penicillin shot, administer one more sedative or apply one more plaster cast. The road to this goal is frequent health maintenance examinations, application of safety and human factors design principles and adoption of sound health practices. Ultimately the flight surgeon aims to maximize the longevity of your flying career; to prolong it safely. In essence, the flight surgeon's sole goal and motto is to "Keep 'Em Flying." However, foremost in his mind is a somewhat foreboding concept of *SAFETY*.

Why then does the flight surgeon seek the grounding of aviators? First of all, by so doing he will probably be protecting and prolonging your flying career ultimately. However, he is also responsible for protecting the flying career of others who could conceivably be affected by your incapacity. When medical restriction is imposed the reasons are varied but most commonly they are:

- *When the condition (illness or injury) may be a hazard to flying safety (and public safety).* It might either interfere with performance or impair efficiency.
- *When the condition may impair individual or personal health, well-being or safety.* It might become immediately complicated or more severe and thereby lead to serious disability or unnecessarily prolonged recovery. The stresses of flying might progressively influence the disease condition adversely causing it to advance more rapidly. Finally, it might preclude the kind of treatment that would be most favored or reduce the likelihood that treatment would be followed satisfactorily by the air crewman.

Thus, when the flight surgeon recommends a medical restriction he has your best interests in mind. Most often it will result in

your more timely and sound return to flying duty. Most often it will help you avoid a condition or complication that *would be permanently grounding*. Frequently, it will be to determine the best way to treat and retard the advance of your condition while still retaining you on flying duty.

The simple upper respiratory infection is covered by minor treatment and a very short medical restriction, thereby preventing the complications of an ear or sinus block, middle ear infection or sinusitis or eardrum rupture each of which would be progressively more disabling or result in prolonged periods of medical restriction, perhaps even suspension. The flight student who avoids the flight surgeon for a simple cold is penny-wise but pound foolish when his flight results in an ear block, infection and eardrum rupture. Often the prolonged period of treatment for these complications demands his elimination from the flight training program.

The moderately obese middle-aged aviator with early adult onset diabetes or high-blood pressure can avoid or fear the flight surgeon, but to his own disadvantage. Early identification and simple treatment of these conditions is most often compatible with continued flying. However, when the aviator permits them to advance undetected he ultimately defeats himself with complications or treatment of an uncontrolled condition that precludes continued flying. Often attempts to conceal symptoms or signs that are potentially disqualifying results in failure to identify and treat a completely remediable condition. Thus, the flight sugeon is the guardian of your flying career. With his advice and recommendations you can often pursue your flying career with greater vigor and determination.

Fears dispelled? Well then, how can you help the flight surgeon help you? First, seek his advice at the first symptoms or signs of an illness or disability. Don't try to second guess the lack of severity or likelihood of getting into trouble while flying. Let the "Doc" do that! He's used to taking care of the worried-well. In aviation it is often the worried-well that avoid disabling complications of otherwise simple conditions.

Avoid self-treatment of any illness or disability. Often this leads to a false sense of security, and if it doesn't compromise flying safety, it will certainly entertain complications or postpone specific treatment.

Finally, give your flight surgeon complete cooperation during flying physical examinations. Don't attempt to conceal or minimize abnormalities. This can only lead to a false sense of security, a failure to truly know your limitations and finally, and most importantly, an occasion to avoid preventive treatment. A good example of the latter is the results of an audiometric exam. Air crewmen generally have an unfounded fear of this hearing examination and will attempt a variety of maneuvers to establish a normal audiogram. To what end? Only to the defeat of our hearing conservation program; likely to the continued accumulation of noise induced hearing loss from lack of adequate protection. Noise induced hearing loss generally goes unnoticed by the air crewmen because, early, it does not involve speech frequencies. This is when the flight surgeon can best protect the air crewman, but it is impossible without an accurate and conscientiously delivered audiogram. Many items on the physical exam fall into this category. Measures of weight, blood pressures, vision, etc.—all are designed for preventative followup.

Even items that are known to be disqualifying for flying duty should be unfeared by the trained and experienced air crewman. Many of these conditions can be waivered administratively when the flight surgeon can be assured they will not compromise flying safety or interfere with mission performance. The flight surgeon will often seek evidence of demonstrated performance through referal to the aeromedical consultation service at Ft. Rucker for inflight evaluation or by recommendations and performance certifications from commanders. Either way, the air crewman, the flight surgeon and the commander are most often assured that they can knowledgeably and securely permit continued flying duty along with medical surveillance. Thus, most often the air crewman is enabled to fly without the burden of fear and apprehension that accompanies a known but concealed or denied abnormality.

For the few individuals who are suspended from flying duty it is most often in their best interests. Not only are they free to pursue adequate treatment of their conditions but they can also live contentedly with the knowledge that they will not endanger the life or safety of their fellow air crewman and countrymen.

Thus, the flight surgeon is not the thumbs down, grounding ogre so often imagined by air crewmen, but the guardian of flying careers and flying safety. His true purpose is to reduce flying noneffectiveness and ultimately maximize the pursuit of flying missions.

EMPHASIS ON QUALITY

Every individual soldier should strive for quality. Those who don't measure up to the expected levels will be on the short end of the stick in the new volunteer Army

Prepared by the Office of Personnel Operations

THE CAUSE OF a downed aircraft is traced to poor maintenance of a component. Someone doesn't know his job or hasn't done it. Poor training or mismanagement? If it is the latter, you can bet it will happen less in the future.

Nothing short of a highly professional quality force . . . today's goal, tomorrow's reality in the Army's effort to establish a truly volunteer organization. For the 45,000 enlisted personnel within the ranks of the Army aviation field, this will mean an increased need for perfection.

Presently, the enlisted Army aviation force is composed of over 70 percent volunteers. In this field volunteers are essential in order to have the best qualified people on hand. Why spend the time to train the draftee and give him the needed training both in quantity and quality and then lose him to the calendar? Retention of top quality personnel is what is needed first and foremost.

What will this new phase in military thinking mean to the individual enlisted man in terms of possible reenlistment or just maintaining his current military occupational specialty (MOS)? The answer is simple. Those people who don't measure up to expected levels, as well as to the attainments of their contemporaries, will be on the short end of the stick. Yes, those men in the 40 MOSs within the scope of Army aviation should be on the alert. With newer management methods, substandard performance will be less tolerable as the Army attempts to fill its ranks with qualified personnel.

Like their counterparts in most other fields in other Army job areas, enlisted men in aviation are discovering some discrepancies in initial Army policies. Why, for example, is the Army seeking higher enlistment rates while at the same time it is involuntarily releasing other personnel?

The answer lies in the need to place decreased reliance on the draft as the primary source for younger soldiers while concurrently attempting to phase the overall Army strength down to lower authorized levels.

Thus, one word—quality—sums up what each individual should be striving for and what the Army is looking for.

What is the Army doing to meet this challenge and launch this new program?

The qualitative management program, announced in change 41, AR 600-200, is a major feature. In a nutshell, qualitative management means those personnel with a history of less than standard performances will no longer be retained in the Army.

The first phase of this program extended to 30 June 1971 with phase two commencing 1 July 1971. It is expected to have a

far-reaching effect on all soldiers straight across the board.

Potential aviation reenlistees should take notice. Realizing career tenure is governed by a combination of time-in-grade and time-in-service while qualitative screening of the enlisted force continues, and then adding the recent announcements raising promotion and reenlistment criteria . . . the message becomes clear: Professionalism and discipline will not be compromised and the "automatic reenlistment environment" will be strictly a thing of the past.

Anyone planning a career in the Army aviation field should evaluate himself in terms of his own specific goals and pose a few questions such as, How am I rated among my contemporaries and how can I stay on top?

The answer to the first part of the question lies in part with the enlisted evaluation system set forth in chapter 5, AR 600-200, and the enlisted efficiency report and rating system stated in chapter 8, AR 600-200.

The former provides an objective measure of technical knowledge of an individual in his MOS, or primary significance to all personnel involved in Army aviation work. The latter system is equally important since it is a subjective evaluation by the individual's supervisor of job performance and potential.

Both are given appropriate weight and together serve to determine if minimum qualifications have been met. Both also rank the individual among his contemporaries by grade and MOS. Placing consistently low can deny an individual the opportunity to compete for promotion, reenlistment and other career opportunities.

Clearly, in the case of most Army aviation personnel, nonqualified individuals are being weeded out of specific MOS areas or out of the ranks altogether. The reason is simple. Showings which are below the levels of contemporaries could mean a substandard performance when it really counts. This really cannot be tolerated nor will it in the aviation field of tomorrow as it gradually becomes 100 percent voluntary in the Army.

Case in point, if the equipment onboard doesn't check out and meet proper maintenance standards, the aircraft won't fly. It's that simple.

This brings us to the final point of which commanders, personnel managers and enlisted personnel throughout the 40 aviation MOS areas should be continuously aware. If an individual is to do well in the aviation field his prior experience, aptitudes and potential must match up. In order for the individual to be in the best possible position to compete in this highly competitive environment he must be placed, within the Army's requirements, in a career field and MOS best suited to the above mentioned criteria. He must then be allowed to develop this potential to the maximum whether his specialty be a technical inspector or an aircraft hydraulics repairman. Only with this complete realization of potential can both the Army and the individual mutually share the benefits. Now, more than ever before, commanders and personnel managers must assess the potential impact on the careers of their personnel prior to any reclassification action between career and MOS fields.

This can be carried further. Especially in the field of aviation malassignment of personnel or mismanagement on their behalf may seriously jeopardize careers. Those personnel not actively engaged in the application of their primary skills tend to lose them. For example, a person with a clerical background would not provide the Army his best potential by being placed in an aircraft maintenance shop, which in turn would hurt him by preventing him from practicing those clerical skills.

Cases such as the one cited above can also put an enlisted man at a disadvantage with his contemporaries during annual MOS testing which includes all fields of aviation. These individuals may even fail to achieve minimum scores needed to verify their PMOS. Some facts to note: failure to verify twice means mandatory reclassification and three failures can result in elimination from the service as specified in chapter 2, AR 600-200.

Thus, the aspect of quality comes into the picture. Since MOS evaluation has such an important impact on the individual, commanders and personnel managers, as well as the enlisted man himself, must ensure that prior study and timely testing, as announced by DA, is completed. This includes the accurate submission of the enlisted efficiency report.

Another fact is that with the absence of current evaluation data, a loss in proficiency pay is quite possible unless the individual has been expressly excused from testing by the Department of the Army.

Today's Army is moving rapidly toward a highly qualified, competitive profession where commanders and personnel supervisors must apply sound management principles. Concurrently, individual soldiers throughout the aviation and other fields must work hard to maintain their skills and a high level of job performance. Everyone comes out on top this way.

DID YOU KNOW

THOSE SILVER wings upon your chest won't put as much bread in your pocket if your pro pay crashed, or your variable reenlistment bonus (VRB) made an unanticipated autorotation on 1 July 1971. The Bird Dog, Beaver and Sioux were coming off the assembly line before you were old enough to say empennage, but face it—you are not a kid anymore and neither are they.

Uncage your eyeballs, it's time to think about career progression. The following MOS are in the "hurting" category in pro pay and/or VRB:

- 67B—Bird Dog/Beaver repairman
- 67C—Otter repairman
- 67M—Sioux/Raven repairman
- 67P—Choctaw repairman
- 67T—Mojave repairman
- 93D—Link operator

When those Tac needles split it's really getting late; do something immediately! Get your skills updated *now*. Know how to maintain the modern equipment. Get a primary military occupational specialty that pays more green stuff.

If you are in an aviation career field and are to be assigned in a flying status in Southeast Asia you must personally hand-carry during shipment, one full-length face-on photograph in fatigue clothing and one each front and side view of head and shoulders in fatigue clothing. All photographs are to be taken without a helmet in accordance with paragraph 3-11 AR 612-2.

Progress through electronic communications. It can help you, the enlisted man, in the aircraft field secure the assignment you want.

A vast new assignment system is the newest tool in the hands of personnel managers at Department of the Army. Labeled as the centralized assignment procedures (CAP III), it now is effecting only senior grade aviation personnel but eventually will encompass all enlisted men in Army aviation as well as all other fields.

This comprehensive assignment system makes use of the computer which compares available personnel assets with known field requirements and then "nominates" one through nine candidates for each assignment. The system (CAP III) also provides for complete manual assignment selection, by-passing the nomination process for such categories of personnel as command sergeants major and WACs.

After a personnel manager chooses the best man for the job, regardless of whether he was nominated by the system or manually selected, the assignment instructions are automatically sent to the field via AUTODIN. The utilization of electrical communications equipment is eventually expected to provide individuals with earlier notification of assignments.

CAP III is expected to improve every phase of assignment making; i.e., the validation of requisitions, the systematic application of established priorities and the desired worldwide distribution of all enlisted personnel.

You will be hearing more about it from your personnel shop in the future.

It will be a steeper climb in the future to get that reenlistment or promotion you may be shooting for. The enlisted MOS evaluation system has been expanded and is now more important than ever.

In fact, many of the 45,000 Army aviation personnel may find themselves being caught short when they become eligible for promotion or reenlistment unless they have taken one of the new special qualification tests.

The new tests are presented in the same format as the regular MOS evaluation tests and do apply to all of the aircraft MOS areas. If you fall into one of the following categories be prepared to take one of the new tests.

a. To be promoted in an MOS other than your PMOS, you must take the promotion qualification test. To take the test you will need your commanding officer's recommendation and a score of 100 or higher on your most recent PMOS test. Procedures for promotion qualification testing are contained in DA (COPO-EPPME) msg 221314Z Jun 71.

b. If you want to reenlist and you do not have a PMOS evaluation score of 70 or higher in the last 12 months, you must take a reenlistment qualification test. Procedures for this testing are contained in DA (COPO-EPPME) msg 141335Z Jul 71.

These two special testing programs are aimed at further improving the quality of the enlisted career force. Your future in aviation is up to you but it should be emphasized that MOS qualification is the responsibility of every soldier, his commanding officer and the personnel office.

VIEWS FROM READERS

Don't misjudge reputations as Custer did. He paid the price for misjudging Indians. You're courting trouble when you misjudge such reputations as those of aircraft, weather, the enemy and yourself. Be sure to read about Custer, Wild Bill Hickok and yourself next month when the DIGEST presents "Not By Reputation" written by Bob Kuenstler, a Department of the Army civilian who "was there"

Sir:

I would appreciate answers to the following questions:

What are the requirements for closing out a flight plan?

Is a radio call to the tower stating A/C is on ground and requesting the flight plan be closed sufficient, or is the aviator required to go into operations to personally verify that the tower has closed him out?

Although current procedure is to radio the tower for flight plan closing and tower has tapes of this conversation, who would pay the bill for search and rescue if the tower operator failed to follow through and close the flight plan?

MAJ David W. Keating
U.S. Army Trans Corps Bn
Corpus Christi, Tex. 78419

• Paragraph 3-16, of AR 95-2, dated 8 May 1970 provides the following guidance: Closing Flight Plans . . . at locations with established military base operations the *aviator will personally* close his flight plan with base operations upon landing . . . at locations with an established FAA communications facility, the *aviator will personally* file an arrival report with the FAA communications facility. At all other locations, *each aviator will personally* file an arrival report with FAA flight service by one of the following means:

1. By radio to the nearest FAA or military air navigation facility or control tower, provided the aircraft is within 3 miles of intended point of landing at the time the flight plan is closed.

2. By telephone, or other expeditious means, to the nearest FAA communications facility or military base operations.

3. By telephone, Government collect, to the appropriate FAA flight service facility when (1) or (2) above are impracticable.

AR 95-2 specifies each aviator will personally close his flight plan. Under these provisions should the plan not be closed it is quite probable that the pilot could be held pecuniarily liable for the expenses of search and rescue.

Sir:

Recently I reviewed an article proposed for publication in the AVIATION DIGEST entitled, "Twelve Cardinal Rules," by Captain Edward Nielsen. An important task of late has been to relate the lessons learned in Vietnam to doctrine useful in other areas of possible future conflict; for example, Europe. To this end, the employment of attack helicopters is of particular concern.

In Vietnam our Cobra pilots usually had the option of level flight at altitudes above 1,500 feet, avoiding small arms fire, except when attacking targets. Another Vietnam option was very low level flight. In the European type environment with radar directed automatic weapons in forward areas, we expect this latter choice to be the only survivable flight regime. Nap-of-the-earth flight is now being emphasized and its feasibility for the Air Cavalry Troop has been amply demonstrated in recent Seventh Army testing in Europe.

Please convey my appreciation to CPT Nielsen for doing a splendid job in writing an article for your fine publication. My best wishes for the continued success of the AVIATION DIGEST.

BG William J. Maddox Jr.
Director of Army Aviation,
OACSFOR
Washington, D.C. 20310

• The article, "Twelve Cardinal Rules," appears on page 6 of this month's DIGEST.

Sir:

The pilots of the 74th Reconnaissance Airplane Company have read with enjoyment CPT Dave Goodwin's "Whistlin' Willie" (April DIGEST) and the subsequent letter by CPT Frank Doherty (August DIGEST). We must however take exception to the somewhat less than accurate closing paragraph of CPT Doherty's letter. "And for each of us a feeling of both pride and sadness together

that we were the last ones to trust her implicitly; because the curtain has come down on the Bird Dog. She has played her last role and the show is over."

The show may be over at Ft. Rucker, but it certainly isn't over for the Reconnaissance Airplane Companies that remain in RVN. Most 0-1 pilots in RVN are still flying over 100 hours per month, still gathering vast amounts of valuable intelligence, and still pinpointing targets for gunships and artillery. The 74th has recently been nominated for its second meritorious unit citation based on its invaluable participation in the actions in Tay Ninh Province and along the Cambodian border, which demonstrates the fact that the contribution made by the RACs in RVN is far out of proportion to the relative age, price and sophistication of the aircraft they fly. So we share CPT Doherty's pride at having flown this fine bird, but will reserve our sadness until the curtain comes down in RVN.

CPT Roger P. Bowers
74th Recon Apln Co
APO 96289

• We at the DIGEST agree—the 0-1 Bird Dog has done and is doing an outstanding job—and has made a lasting and memorable mark in the annals of Army aviation and will have a special place in the hearts and minds of Army aviators forevermore . . . .

Sir:

I am interested in translating into Spanish your aviation material as applicable to flight safety and rotary wing flight.

The material would be printed into a magazine and would exclude military operational techniques, instead the copied and translated material would be on flight safety or professional pilot procedures. It is intended for civil aviation in Spanish speaking countries.

Luis Silvestre
Director-Flight Training, AGT
Hato Rey, Puerto Rico 00919

The November 1971 "Views From Readers" section of the DIGEST carried a U. S. Navy memorandum warning about hydraulic failures caused by chafing of tubing and cited five aborts as the result. It was erroneously reported that this memorandum was originated at the U. S. Naval Safety Center; our sincere apologies to the Naval Safety Center for publication of this error.

• The DIGEST has no objection to translating and reprinting DIGEST articles in Spanish. Our only request is that the DIGEST and author be credited as the original source of the material and that the DIGEST not be held responsible for the accuracy of the literal translation.

Sir:

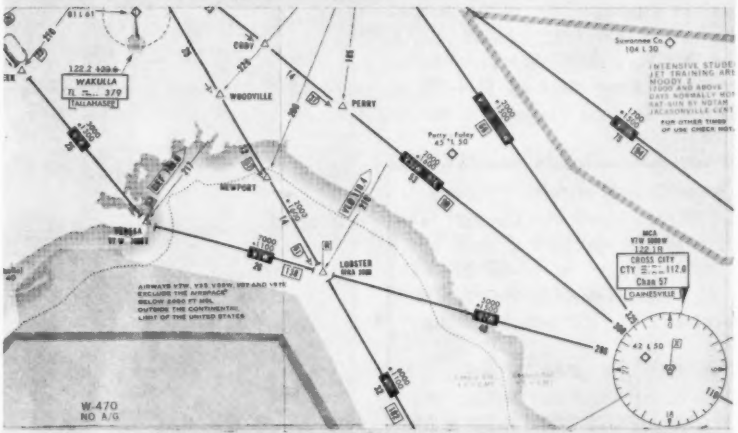
Regarding the article "Emergency Escape System for Helicopters" written by CW4 Paul H. Johnson which appeared in the August 1971 issue of AVIATION DIGEST, I would like you to pass along to him my congratulations on an article which was very informative, well-written and particularly poignant. Although I am not an aviator, I have flown in Army aircraft often enough to appreciate the conditions and realize the facts of which CW4 Johnson writes.

He wrote his ideas clearly enough for a layman such as myself to understand and learn. I hope that the decision-makers in the Army aviation world take his ideas to heart. I'll be looking for more articles written by CW4 Johnson in issues to come.

CPT Paul A. Gorka
Hq CONAC
Ft. Monroe, Va. 23351

INSTRUMENT CORNER

Q. During IFR flight with lost communications, when proceeding at last ATC assigned altitude you must traverse a segment on your route with an MEA higher than your assigned altitude. Do you climb to the higher MEA and proceed at that altitude for the remainder of the flight, or do you descend back to your last assigned altitude when the MEA drops to a level lower than last assigned altitude?



A. The solution here is to fly either the last assigned altitude or the MEA, whichever is higher. So, you'd fly your last assigned altitude until you come to a leg in your route of flight where the MEA was higher than your last assigned, then climb to the MEA and maintain MEA for only that portion of your flight where the MEA is higher, then you would descend to the last altitude assigned by ATC. A good example is passing Creek intersection on V7W to Cross City VOR. As you pass Creek intersection at 5,000 feet you lose communication. You would have to climb so as to cross Teresa intersection at 7,000 feet. After passing Lobster intersection you would descend back to 5,000 feet. Don't forget to turn up the volume on your navigational aids. I am sure someone will be calling you. Also put your transponder on Mode 3 Code 7600.

Reference: FLIP IFR-SUPPLEMENT, page 448, dated 14 October 1971.

The Armed Helicopter Story

Part VI

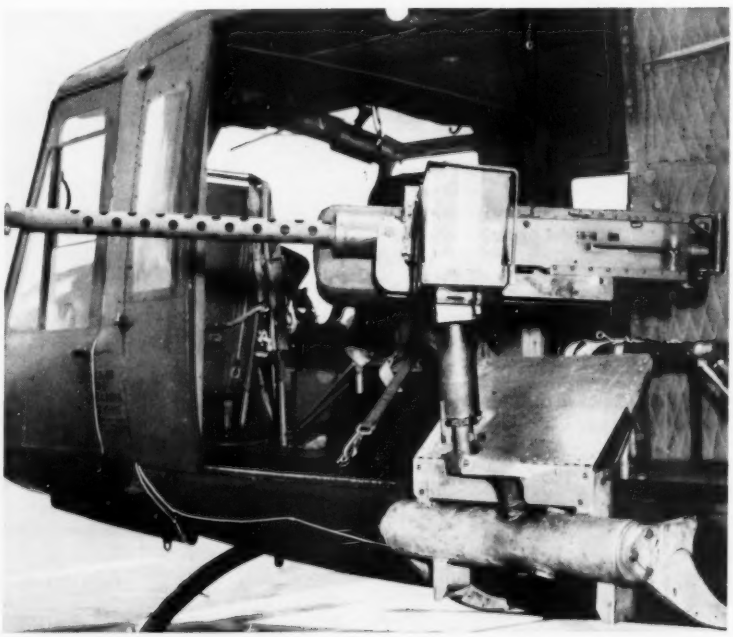
(conclusion)

XM-51 thru GAU-2B/A

Lieutenant Colonel Charles O. Griminger

XM-51: One each XM-129 40mm grenade launcher mounted in the nose turret of AH-56A; ammunition capacity (A), 780 rds; manufacturer (M.), Emerson Electric. In **XM-52** configuration it is mounted in the belly turret of AH-56A. **XM-53** is the same configuration as XM-51 except the XM-53 ammunition capacity is 11,570 rds.

XM-59 (right): Two each .50 cal mg; A, 1,000 rds; weight, 1,118 lbs; MER, 1,800 meters; one gun at each cargo door of UH-1D & H; thus far has caused excessive vibrations.



M-60C (no photo): One each 7.62 mm M-60 NATO mg; 600 shots per minute (spm) aircraft version of M-60 NATO mg. The **M-60D** is the flexible version of 7.62 mm M-60 mg.

M-61A1 (no photo): One each six-barrel 20 mm Vulcan mg; spm, 6,000; M-61 has a 60-inch barrel and M-61A1 modification has a 40-inch barrel.

M-75 (no photo): One each 40 mm grenade launcher.

TAT 101 (no photo): Two each 7.62 mm M-60C mg; A, 500 rds mounted in chin turret of UH-1E; developed for U. S. Marine Corps.

TAT 101E (no photo): U. S. Army adaptation of TAT 101 to UH-1. **TAT 102:** One each 7.62 mm GAU-2B/A gun, chin turret mounted; A, 8,000 rds; aircraft developed for (acft), AH-1G. **TAT 103 (no photo):** Two each MG1 7.62 mm mg chin turret mounted; A, 500 rds; acft, UH-1D & E; designed for Federal Republic of Germany.

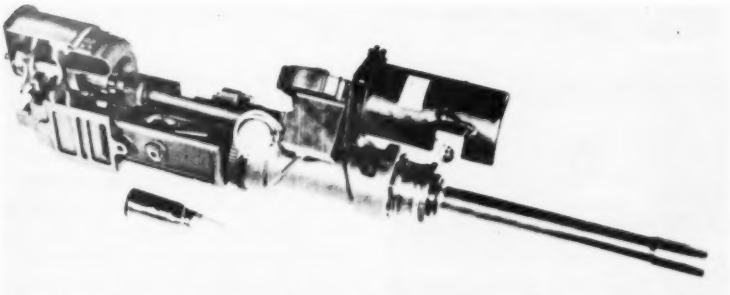
XM-129 (no photo): One each 40 mm grenade launcher; spm, 400; weight, 43.5 lbs; maximum effective range (MER), 1,800 meters; redesign of **M-75;** utilized in **X-28, XM-51** and **XM-8** systems.

XM-130 (no photo); One each 20 mm automatic gun; redesign of **M-61** to provide gas drive (see **M-61A1**).

XM-133 (no photo): One each 7.62 mm high cyclic rate mg.

XM-134 (no photo): One each 7.62 mm high cyclic rate mg with electric drive; spm, 2,000, 4,000 or 6,000; weight, 60 lbs; MER, 1,500 meters; utilized in **XM-18E1, XM-27E1, XM-53, TAT 102** and **XM-28.**

XM-138 (no photo): Former designation for **XM-5** system.



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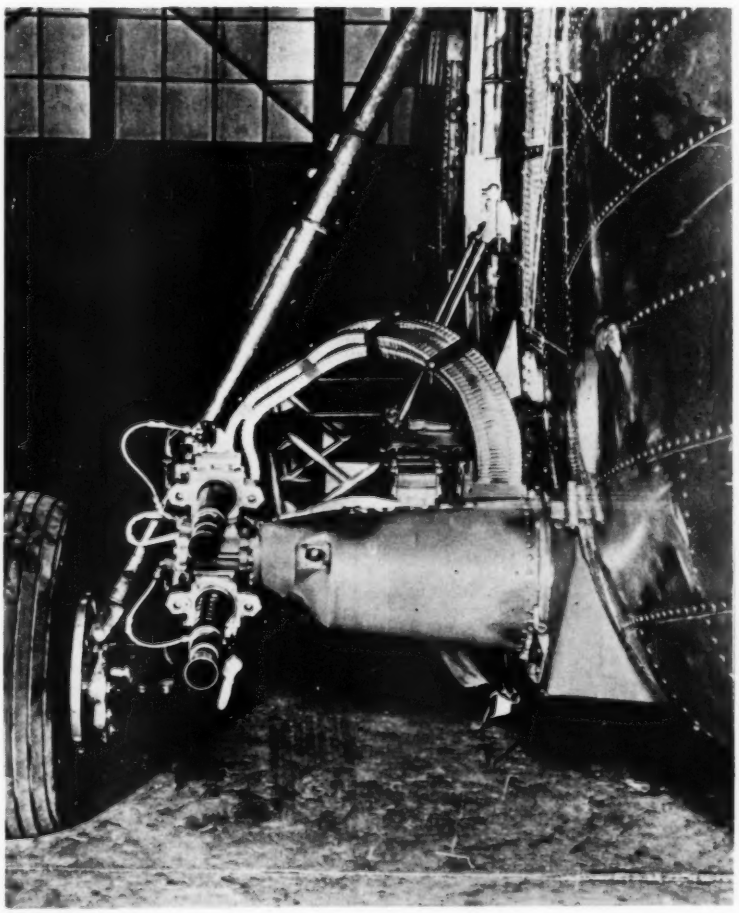
XM-140 (left): One each 30 mm automatic gun single barrel; spm, 425; weight, 148 lbs; MER, 3,000 meters; utilized in **XM-30** and **XM-52** systems.



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TAT 141 (no photo): Chin turret same as **XM-28.**

XM-141 (no photo): One each 7.62 mm rocket launcher 7 tube, reloadable, reuseable.

XM-153 (no photo): Four each M-73 7.62 mm mg; MER, 1,000 meters; developed from the Emerson fire suppression kit; in use in early 1962, development began 1959.

XM-154 (no photo): XM-153 mounted on CH-21.

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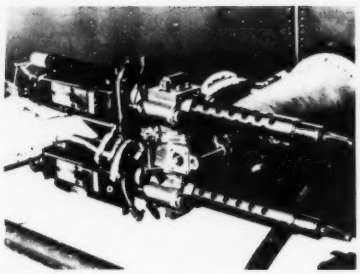
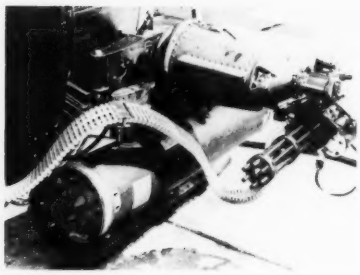
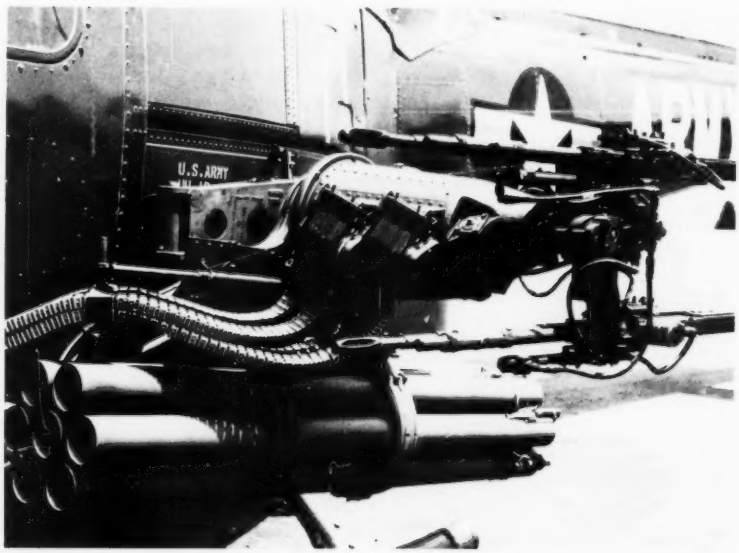
XM-155 (left): XM-153 mounted on CH-34.





XM-156 (far left): XM-153 mounted on UH-1A & B.

XM-157 (left): 2.75-inch rocket launcher (LSFFAR) pod with provisions for 7 rockets, reloadable, reuseable, not repairable; weight, 200 lbs approximately; MER, 3,000 meters; acft, UH-1B & C.



XM-158 (lower left): 2.75-inch rocket launcher (LSFFAR) with 7 each aluminum tubes 53.5 inches long, reloadable, reuseable and repairable; weight, 195.5 lbs; MER, 3,000 meters; provided a reuseable rocket pod; used with **XM-16, XM-28;** tested in 1965, delivered in 1966; acft, UH-1B & C.

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XM-159 (left): 2.75-inch rocket launcher (LSFFAR) pod with provisions for 19 rockets, reloadable, reuseable, not repairable; weight, 648 lbs; MER, 3,000 meters; provides larger capacity; tested in 1966; acft, UH-1B & C, CH-47A, AH-1G and AH-56A.

XM-159C (no photo): XM-159 with 58-inch tubes.

XM-195 (no photo): Short barrel version of **M-61A1** 20 mm gun; spm, 650-850; used in **XM-35** system; acft, AH-1G.

XM-200 (no photo): 19-tube version of **XM-158** launcher.

GAU-2B/A (no photo): 7.62 mm high cyclic rate gun with electric drive; spm, 6,000; same as **XM-134.**

Mission: Possible

Continued from page 5

area at 400 feet MSL. Kamikaze's award read: "Pilot turned into the wind, notified the flight leader of his emergency, selected a suitable landing area and landed with no further damage."

Incredulous!

Astounding!

Stunned, I sat down and my mind Walter Mitty'ed back to when I was basic instrument student. And suddenly I realized that there was a little of the four horsemen in *all* of us. I had allowed time and distance to enhance my self-image and had compared my student's control touch, reaction time, etc., to mine as an IP.

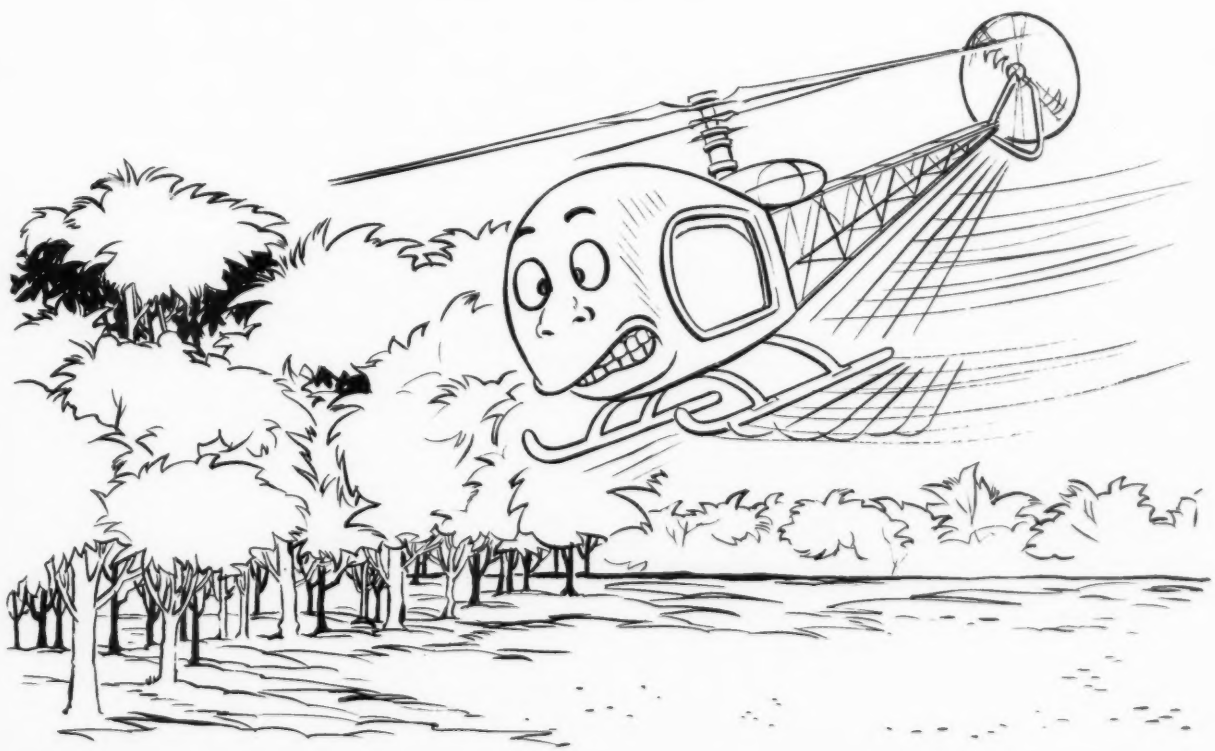
It is now 10 months and many classes later and I approach my job with a different point of view. Now I try to instruct my students in the most effective manner possible, avoiding the pitfalls of pigeon-holing them in preconceived notions of what I imagine them to be capable of attaining. I realize that with the seemingly endless cycle of students, the same maneuvers, the same errors, it seems as if you're always flying between tedium and monotony with a destination of complacency. But, by enthusiastically approaching our jobs as a challenge and by maintaining our flying and instructional proficiency, we can file for an alternate-motivation.

Today is the start of a new class and while waiting for my student, who is now approaching, I am trying to finish this article.

"Sir, do you want me to drain the fuel?"

I thought of Clouseau, smiled, then answered, "Yes, go get the jar."

As a parting thought, I think it is important for each of us as Army instructor pilots to realize that it's our mission to train the best aviators in the world and to afford them the finest instruction of which we are capable, bearing in mind that each individual personality is like a highly complex computer with both strong and weak points which must be taken into consideration and evaluated before coming to . . . THUD . . . CRUNCH . . . CRASH . . . .



Maintenance

. . . when heaters are needed

Bird Dog Talk: If the 0-1 aircraft will not start and it is determined that the carburetor is not allowing fuel to be delivered to the cylinders, the most probable cause is a sticking plunger stack (P/N 383667) (refer to TM 1-6R1-3-5-34, dated 2 Aug 60, figure 1, item 113). TM 55-1510-202-20 states in the troubleshooting chart that if the engine fails to start due to the carburetor that the carburetor should be replaced. Experience in the field has proven that in the majority of cases the sticking plunger stack is the cause of the trouble. It is recommended that prior to replacement of the carburetor the plunger stack should be checked. The following procedures should be followed:

- Remove cotter pin in lever assembly, fuel cutoff (P/N 383948, figure 1, item 109).
- Remove lever.
- Remove plunger; clean plunger and spring. Use cloth to wipe out receptacle in carburetor.
- In dusty areas leave bottom of plunger dry.
- In high humidity areas apply a light coat of oil.

This corrective action will save much money as well as aircraft downtime if the plunger is the cause of the trouble. It requires approximately 1 hour to accomplish the above steps as opposed to approximately 10 hours to replace a carburetor including soaking time and test flight.

U-21 Heating System: Care should be taken in ground operation of the U-21 type aircraft heating system. With a failure of the ventilation air blower there won't be sufficient air for cooling of the heater during operation. To check for ventilation blower operation turn blower switch on, defrosters on and feel for air flow at defroster outlet.

Keep The Torque On: U-21 wheel brake assembly mounting bolts should be torqued frequently (150-180 inch pounds). They have a fiber self-locking nut that loosens due to heat that is generated at that point.

U-8D Tip: Supercharged engines produce more heat than unsupercharged engines; therefore, engine temperatures must be watched closely and every precaution taken to see that temperatures do not become excessive since the risk of detonation increases with engine temperatures.

Monitor Those Gauges: During cold weather high oil pressure immediately after engine start on the U-8D is not unusual, but if a

Matters...

prolonged high pressure reading prevails shut down the engine and investigate.

Know Your Switches: At least one system air supply switch on 1967 and 1968 OV-1C models must be in the "open" position. If both switches are in the "closed" position you will have no engine bleed air for wing and tail de-icing, hydraulic reservoir pressurization, windshield wash tank pressurization or cockpit heating or cooling. Also, with the system air supply switch in the "closed" position you could damage one or both hydraulic pumps.

Do It By The Book On The OV-1: The chock screws on the AERO 1A sway braces should be tightened as outlined in the TM. If the chock screws are inadvertently overtorqued the latches on the AERO 65A rack cannot be retracted to release the drop tank by either electrical or manual means. Reference paragraph 4-107.4.(6)(7), TM 55-1510-204-20/1.

U-8 Maintenance Tips: Do not set the parking brake during extremely cold weather. Moisture in the lines may freeze rendering the brakes ineffective.

Towing The U-8: Do not tow aircraft with rudder locks installed as this may cause severe damage to the nose steering linkage.

Fire Detection System: The fire detection system is designed to detect the presence of fire in zones such as engine compartment and combustion-type heater compartment, and to light a red warning light in the pilot's compartment in event of fire.

a. Maintenance:

(1) Replace defective control unit with a serviceable unit.

(2) Maintenance of the three types of detector units is as follows:

(Caution: Do not bend sharply, kink or twist sensing element during installation. Minimum allowed curve radius is 1 inch.)

(a) Replace sensing element only when physical damage such as chafing, bending, twisting or breaking has occurred. Replace attaching parts when found to be defective. (Caution: Bends will not be less than 2 inches in radius.)

(b) Replace cable detector only when physical damage such as chafing, bending, twisting or breaking has occurred. Make all bends and routing with fingers only. Replace all attaching parts when found to be defective.

(c) Replace mounting brackets of thermocouple detectors when cracked, corroded or damaged. Replace attaching parts when found to be defective.

Note: When replacing thermocouple detector note which wire is connected to identified plug terminal of defective unit and connect replacement in the same way.

b. Testing:

(1) Test system for proper operation by turning on power supply and placing FIRE DET TEST switch in test position. Red warning light should flash on within 10 seconds. Turn switch and power off.

(2) Tests required after repair or replacement of units in fire detector system or when system is inoperative are as follows:

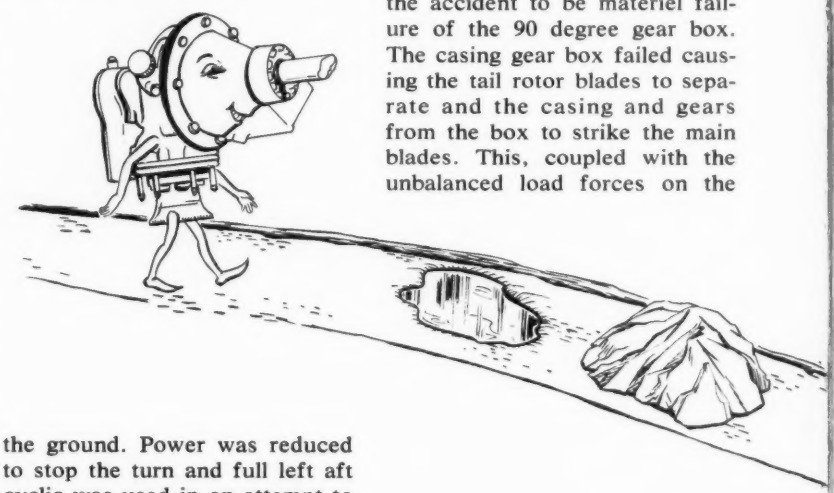
(a) Replace lamp in warning light when warning light does not flash on.

(b) Polarity, ground, resistance and continuity tests are required for systems with thermocouple detector units.

(c) Resistance and continuity tests are required for systems with sensing elements or cable detector units.

A Repair Part

Lieutenant Walter H. Zimmers
CW3 Jonathan J. Hasbrouck



ST. PETER HAS given me the day off, so I thought I'd drop a line and let you know what really caused our bird to crash. That fateful day was beautiful for flying, with the sun shining and the sky clear. We got up around 0730, ate breakfast at the club and proceeded to operations. Their weatherman claimed all the credit for the shining sun. The helicopter had just completed the eleventh periodic inspection (PE) 27 hours earlier. The preflight revealed nothing and the crew chief had it as clean as a pair of boots ready for the annual general inspection (old Army type). The whole day looked very promising; we were planning to visit the aviation museum, then continue the flight for some IFR training.

We practiced a few takeoffs and approaches with the aircraft flying so smooth that it felt like it just came from the factory. This was a rare bird. In my 10 years in aviation maintenance this was the first time I had seen an aircraft that flew as well as it looked. It was a true maintenance officer's dream.

The instructor pilot (IP) decided that one or two approaches into confined areas were in order and then we would depart the area.

The first area we entered was rather large and the takeoff was a breeze. However, the next confined area was our final resting place. On takeoff, just as we cleared the trees, a high frequency vibration started—followed by a loud noise. The aircraft started a rapid turn to the right with complete loss of antitorque control. About the same time something struck the main rotor blades, causing loss of about 3 feet of one of the blades.

The aircraft continued the turn to the right, rolling as it neared the ground. Power was reduced to stop the turn and full left aft cyclic was used in an attempt to recover the aircraft, but to no avail. The impact was deadly.

The only questions I have are: Why? Why me? Why the aircraft that performed so well?

The accident board found the IP had 3,000 hours in that type aircraft. Both the IP and myself had had a good night's sleep, a full breakfast, good family relations, no money worries and both the IP and pilot were maintenance officers with 30 years combined experience in Army aviation maintenance.

The aircraft was given a clean bill of health after the last major physical—all time before overhaul (TBO) items were current. The aircraft records were checked without revealing any past serious deficiencies. In fact, it had never had a hardship tour overseas. Then why did this aircraft crash killing all on board?

The board found the cause of the accident to be materiel failure of the 90 degree gear box. The casing gear box failed causing the tail rotor blades to separate and the casing and gears from the box to strike the main blades. This, coupled with the unbalanced load forces on the main rotor blades, caused the IP to lose control. The IP and pilot did everything by the book to include calling out a brief "Mayday." The tech inspector, crew chief and maintenance officer did everything by the book. Why did this aircraft suffer a fatal crash from materiel failure killing everyone on board? Read on and find out how the crew chief requisitioned his funeral, and mine, instead of a repair part.

Remember, it may be you the next time; it can't be me.

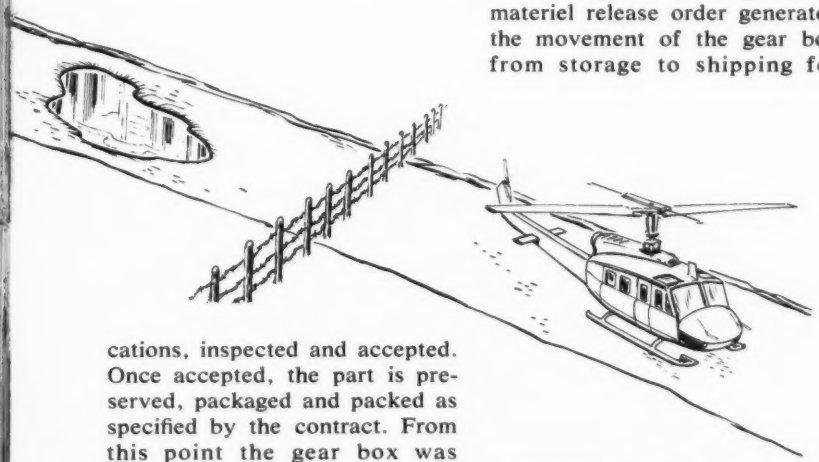
* * *

Materiel failure? Why stop the investigation on that note? It would be more beneficial to use the failure of that gear box as a reason to investigate all the probable causes of the failure.

Or A Funeral

In this case the 90 degree gear box was installed during the aircraft's eleventh PE just 27 hours earlier. To get the gear box the mechanic had to put in a request to his supply support activity. Before the mechanic could actually obtain the gear box a very complex system of exchanges and procedures had to be performed.

The first step in providing a repair part is the issuance of a procurement contract. The part is then manufactured to specifications, inspected and accepted. Once accepted, the part is preserved, packaged and packed as specified by the contract. From this point the gear box was shipped by direction of the national inventory control point to a supply depot to be stored pending future requirements.



Upon arrival at the depot the gear box had to be offloaded from the carrier and processed through the receiving area. Current disposition required it to be placed in a bulk storage area until needed.

When the need arose the gear box was moved from bulk storage to the retail bin area and held there pending a materiel release order directing shipment to a direct support unit (DSU) supply activity. Upon receipt of the materiel release order the gear box was moved to the shipping point and processed aboard a carrier enroute to the DSU.

After arrival at the DSU the gear box was unloaded and processed through receiving. It was then placed into storage by the same general procedures utilized at the depot. Here again the materiel release order generated the movement of the gear box from storage to shipping for outprocessing to the requesting unit.

When the unit personnel picked up their issues the gear box was transported to the unit's supply receiving area. Then the gear box was processed into informal storage until the mechanic presented his request for it.

When the mechanic received the gear box he carried it to his work area and placed it in a temporary niche until it could be installed.

Though seemingly a comical parade, the gear box was exposed to many deadly serious hazards in its journey.

At the manufacturing plant the person in charge of controlling the ingredient mixture became involved away from his post during a critical moment, and the improper ratio of ingredients were mixed for the metal content of the case. This weakened the metal case and set it up for failure during operation.

Later on, as the completed part was being preserved and packaged, the sealing machine didn't quite complete the seal and the gear box was only partially protected.

When the commercial carrier picked the gear box up for shipment to the depot a mixup caused a delay in shipment and the load was left outside in a rainstorm. The unsealed package with the gear box collected a small amount of condensation.

The shipment finally arrived at the depot receiving area and the forklift driver plunged right into his work and moved the gear box load through receiving and right down to the storage area. When he arrived there a sudden stop caused his load to topple and the gear box sustained possible internal fractures from a 3 foot fall.

The day the gear box was to be shipped to the DSU, it was loaded onto a commercial carrier and shipped. Within the trucking terminal a load transfer took place—the loader being a one-man dynamo who proceeded to throw the gear box across the ramp. Again the gear box sustained possible internal fractures from a 10 foot lateral transfer through space and reentry onto hard concrete.

At last the gear box arrived at the DSU to be inprocessed. Here because of a personnel shortage (i.e., troops were in classes, heavy detail commitments or understrength conditions) the part was delayed through receiving long enough to be soaked from another rain. Condensation really set in at this point.

As the gear box lay in storage for a long period of time (this supply activity didn't practice stock rotation) the condensation began a corrosion process. Little by little intergranular corrosion ate away at the strength of the metal case.

After a long storage spell the gear box was issued to a unit down the line. The driver of this unit was no gold brick and loved his work. His good intentions drove him to being a high speed loader, i.e., he tossed everything onto his truck as fast as he could. This, of course, caused the gear box to be bumped around and then smothered by big and heavy boxes. In addition, the ride wasn't any too easy as the load shifted several times because it wasn't tied down.

At the unit the prescribed load list clerk issued the gear box to a grateful mechanic. The day was getting short and before he could go home he had to "slap" that gear box on. No one noticed the way he torqued it down nor did they notice the internal crack resulting.

The mechanic went home happy; the maintenance supervisor was happy; the CO was happy. But is that dead on arrival pilot happy? Most likely because he is in the "happy hunting ground."

It is fairly evident that with all the parts utilized on an aircraft and all the hazards they're exposed to in manufacture, shipping, handling, storage and installation, each flight is a walk on thin ice. What can be done to reduce the hazards and keep the problems to a minimum?

Everyone involved from mechanics to commanders should be thoroughly interested in their levels of supply operation. They should be inspecting and investigating their supply storage areas for proper storage procedures, protection given to supplies and handling procedures utilized by storage personnel and drivers. Any discrepancies noted should be reported to the supervisor involved. (How many times have you noticed a truck laden with supplies and heavy crates carelessly thrown on top of small items?)

There are in the system procedures designed to eliminate detected faults. The equipment improvement recommendation (EIR) for instance is available to maintenance personnel for reporting faults or noted hazards in maintenance channels.

There are three other reports available designed to create corrective actions and purify the system: Standard Form 361, Discrepancy in Shipment Report; DD Form 1599, Report of Item Discrepancy; and DD Form 6, Report of Packaging and Handling Deficiencies.

There is an economic side to this problem as well as a safety aspect. Many items arrive at their destination damaged and are junked before installation. It is conceivable that because of improper packing design, nine out of ten items arrive in an unserviceable condition. That means you are paying for ten in order to use one. This also may increase downtime waiting for that one serviceable item to come through. An OH-13's bubble, FSN 1560-374-6902, is currently listed as costing $225. That makes it expensive to lose and the aircraft won't fly without it, which makes it even more expensive to wait for a new one. Futhermore, they will continue to arrive broken if there is a deficiency in packaging until someone reports it.

Continuous inspection, analysis of supply problems and evaluation of supply procedures must be made by all commanders, supervisors and personnel within the system.

Extensive use must be made of technical inspectors to "watchdog" supplies in storage in order to catch damage, improper procedures and contamination.

Continuous training programs must be in effect by supply activities concerning the proper methods and procedures for storage and handling.

Tech inspector personnel must be utilized in all receiving processes to preclude unserviceable parts from being turned in, accidentally placed into storage and later reissued.

Loading procedures, vehicle loads and movements must be closely observed by supervisors to ensure proper load displacement, securement and transport method.

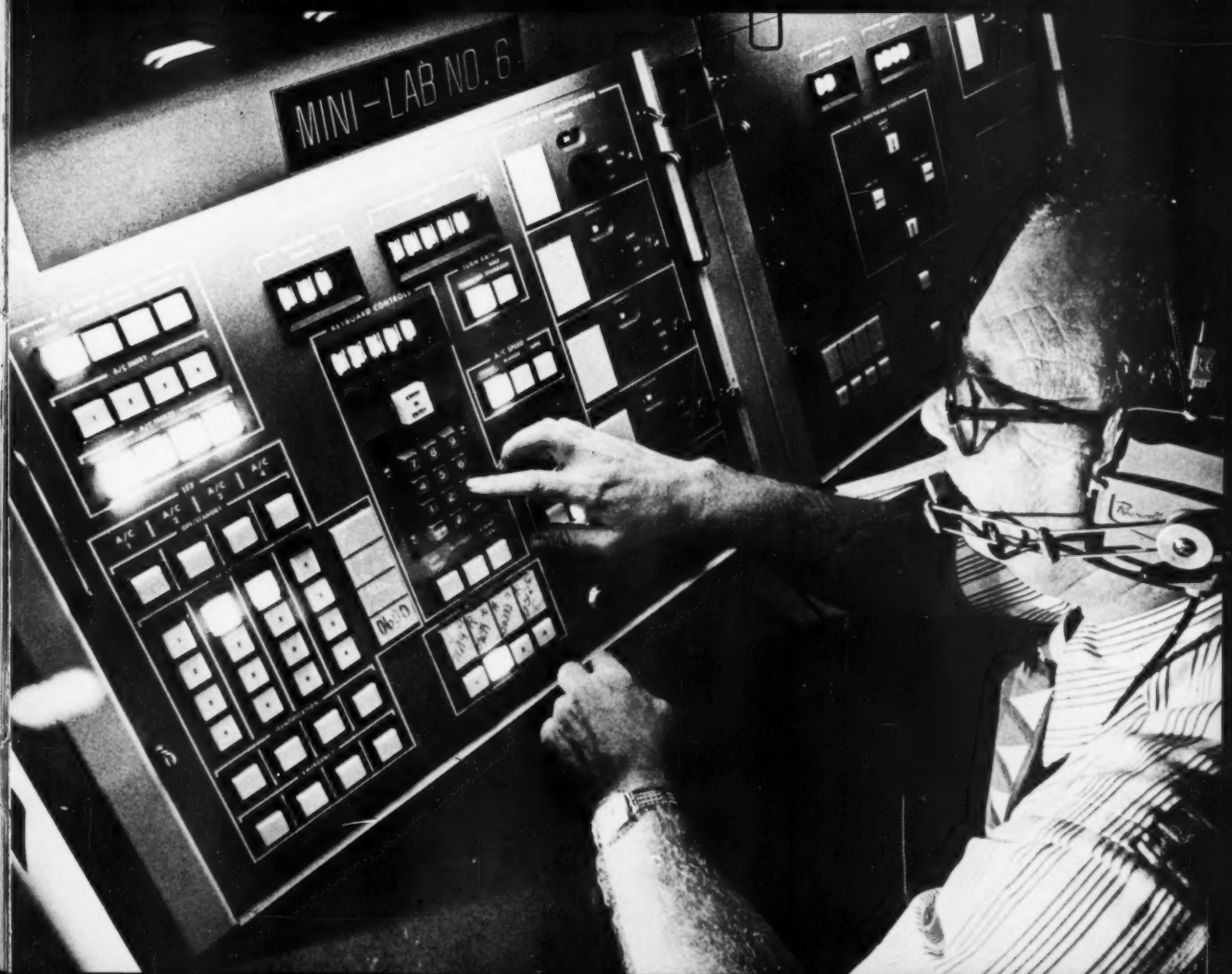
Finally, everyone should look around them and see the possible hazards waiting for an opportunity to develop.

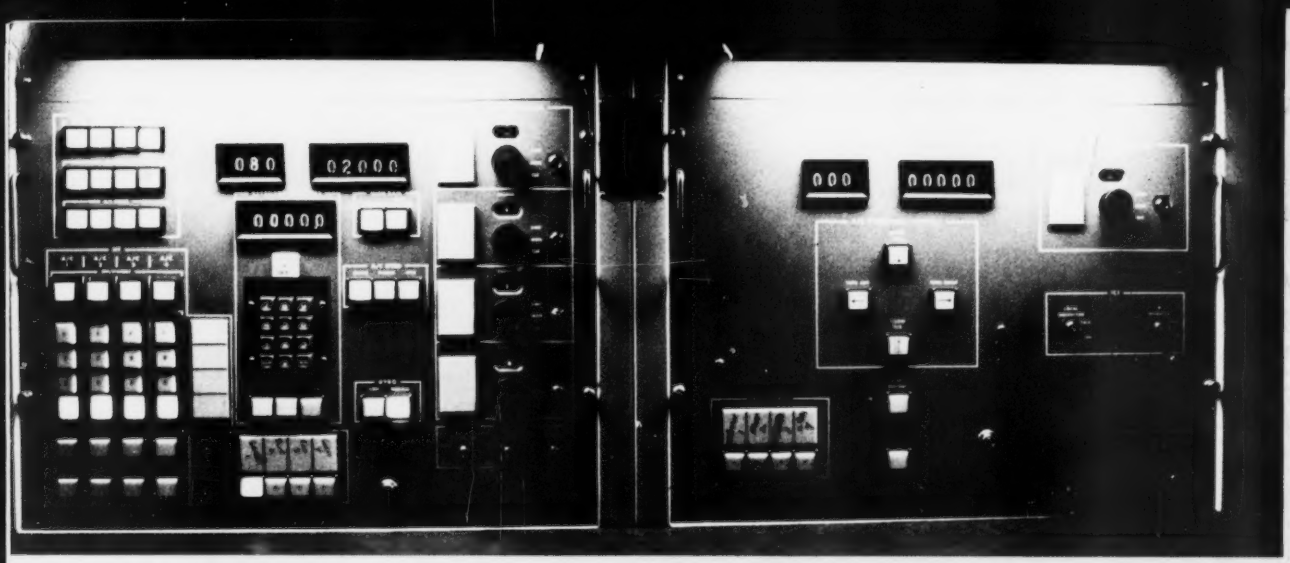
That invisibly corroded bearing unwrapped in the mechanic's tool box . . . the sheet metal laying on the floor getting its protective coating scratched . . . that unwrapped electrical switch in the tool box . . . the close tolerance bolts pitted and weakened with rust—the list of possible hazards is endless. If you want to keep using Uncle Sam's wings instead of a pair from St. Peter, keep on the lookout for possible hazards.

ATC TRAINING GOES COMPUTERIZED

Story by CW2 Mike Sheley
Photographs by Captain Tom Greene

IN A DARKENED room at the Army's air traffic control (ATC) school at Ft. Rucker, Ala., the most advanced concepts in training and simulation are being used to train personnel to become radar approach controllers. A new computerized radar target simulator device designated the 15G16 replaced the vintage An/GPN-T2A target generator system that was acquired from the U. S. Air Force in 1969 when the Army took over





the responsibility for training its own air traffic controllers.

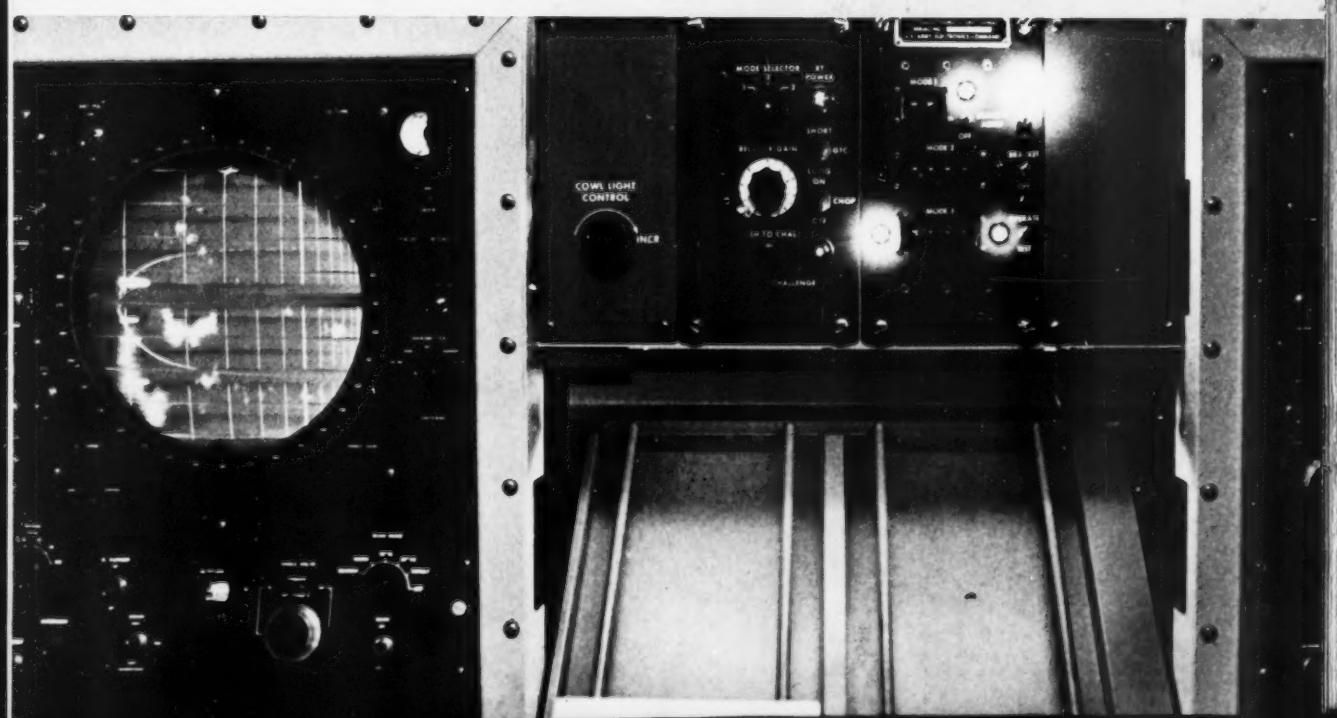
"The T-2 system was old stuff, World War II vintage," explained Captain Larry R. Alexander, chief of the Operations Branch, Specialist Training Division, Department of General Subjects. "The T-2 target generator was limited to two targets, whereas the 15G16 is linked to a new Sigma 5 computer built by the Xerox Corporation and can simulate up to 40 targets at one time."

Device 15G16 utilizes the same radar indicators (An/TPN-18) that the students will be using once they are assigned to an Army field radar unit. The various controls and switches will perform the same functions on the simulator as they do on an operational field radar unit. Thus, a student will be able to transition from the simulator to an operating radar unit with very little additional training. The new trainer was built specifically to incorporate all phases of radar air traffic

Above: the target control unit. Its job is to put aircraft on the training student's TPN-18

Right: two students operate the pseudo pilot stations which control the aircraft projections on the radar screens

Below: TPN-18s on each side of TPX-44. Both can be used to simulate precision and nonprecision type approaches

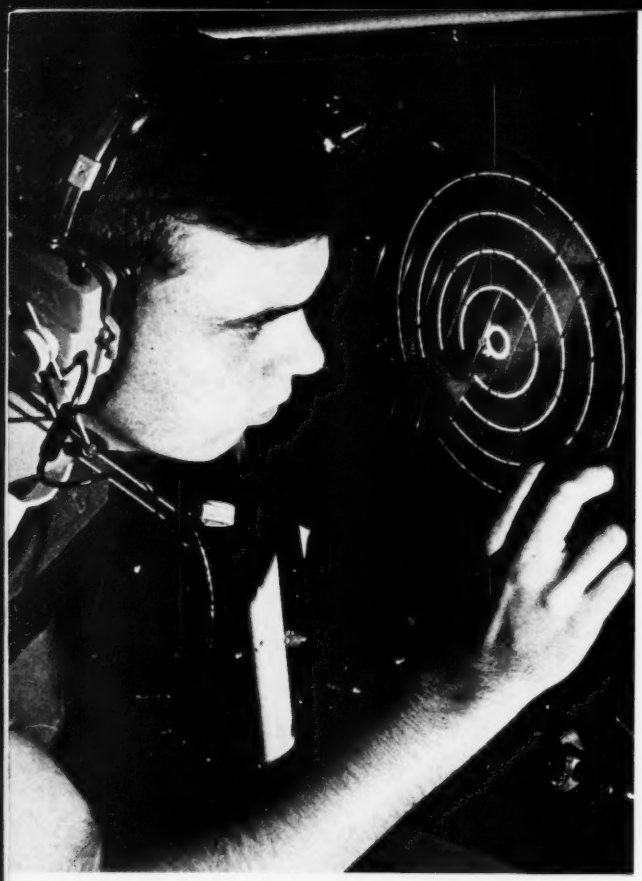


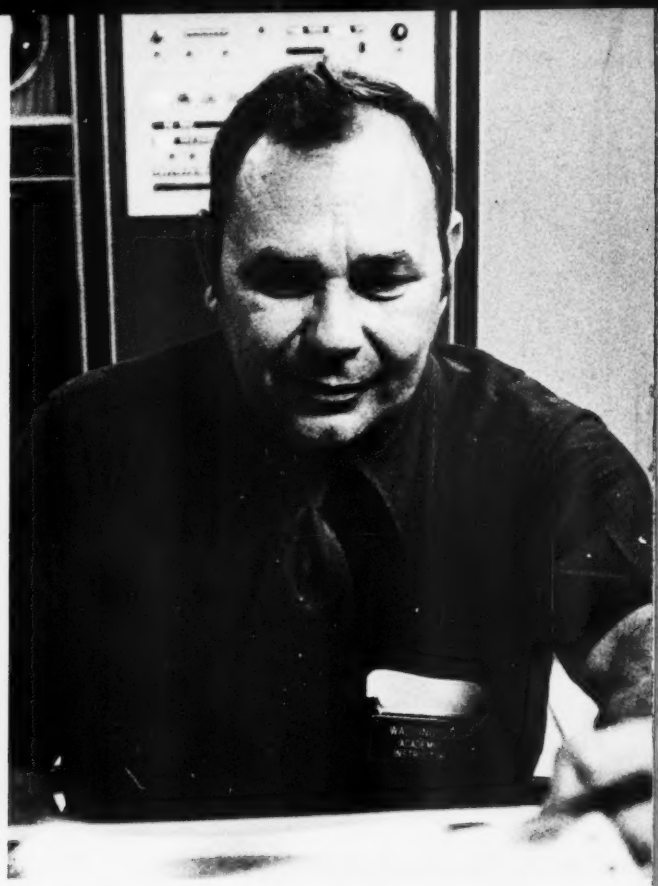
control. Ground control approach students are being trained on the device.

There are 10 minilabs associated with the trainer. Each minilab contains a controller's console and a target control unit. Each controller's console contains a surveillance controller's position, a precision controller's position and a flight data position. The target control unit, or psuedo pilot station, has a surveillance position and a precision position. Up to 50 students can be trained on the device at one time.

Some of the features that have been designed into device 15G16 to produce realistic simulation of radar air traffic control situations are as follows:

- The 10 minilabs simulating GCA sites can be placed anywhere within a 512-mile area by programing their X and Y coordinates to specific locations. Two sites can be programed to overlap so that radar handoffs can be practiced.
- Weather can be simulated on any or all of the minilabs and can move from any direction at speeds up to 60 knots.
- The wind can be programed from any direction at speeds up to 100 knots. Students can be trained to control air traffic with headwind, tailwind or crosswind components.
- The aircraft can be indicated at any altitude up to 60,000 feet and a climb/dive rate assigned that is realistic for the type of aircraft being simulated.





Above left: an ATC student vectors an aircraft on the TPN-18. Bottom right: instrument programer Mr. Berry monitors a student in training. Above right: Carl Waddington operating the 15G16 target simulator controls it all. Mr. Waddington is feeding information from the teletype machine into the Sigma 5 computer, commonly called "Old Blue"

• Each aircraft is assigned a cruise, maneuver and an approach speed. Thus, you might have an aircraft cruising at 200 knots, maneuvering at 150 knots and making final approach at 100 knots. The maximum speed available is 2,000 knots. The aircraft automatically slows to approach speed once the turn to final is made.

• Selective identification features (SIF) codes are displayed on the simulator's indicators in the same manner they are displayed on operating radar sites.

• The student must learn to use the servo controls to keep the antenna aimed in the most advantageous position to receive their aircraft targets.

All ATC students go through 9½ weeks of basic ATC training. They are then sent to one of the three advanced schools (also located at Ft. Rucker):

93J—Ground controlled approach specialist

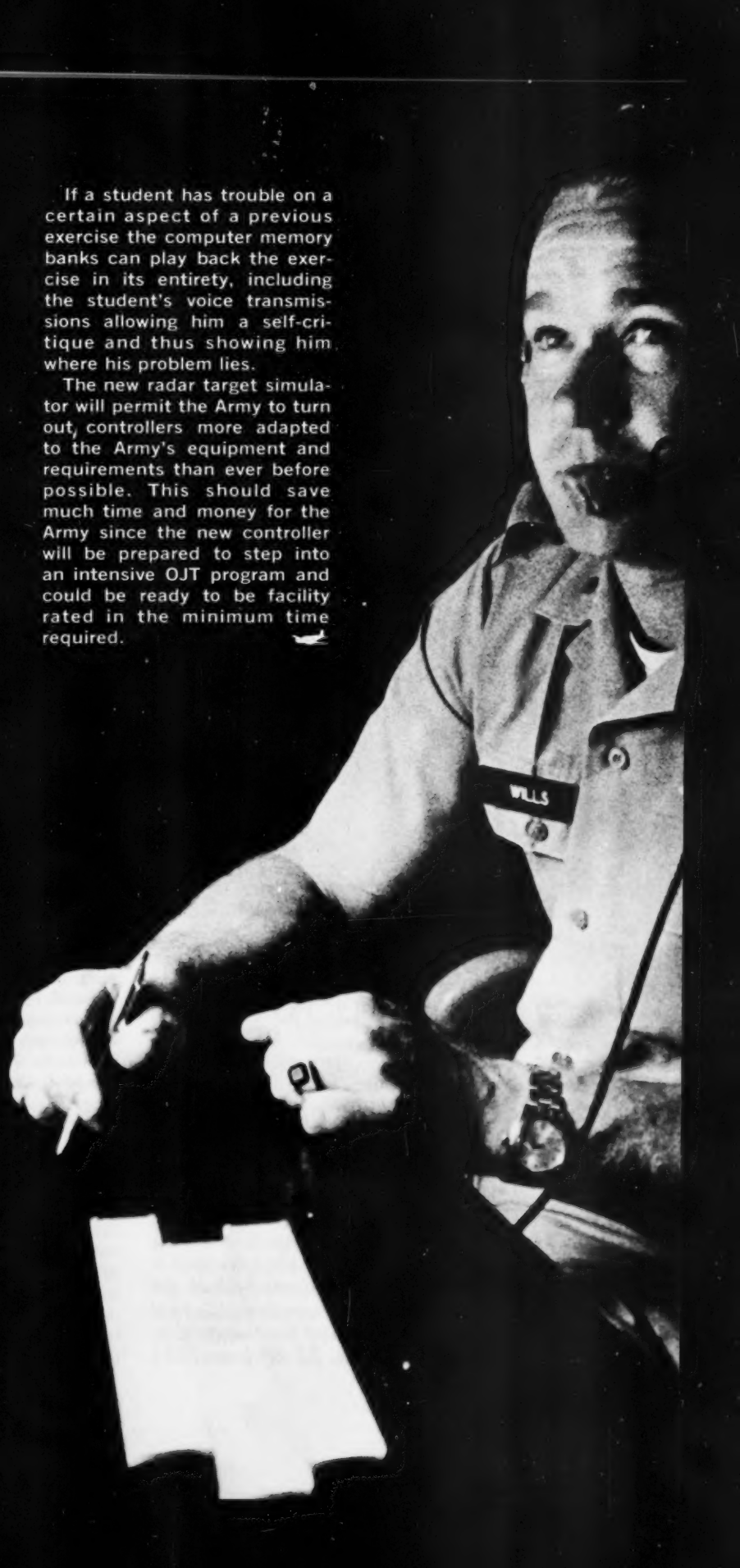
93K—Approach control specialist

93H—VFR tower operator

The 93J and 93K advanced courses are linked to the computer. It requires five students to perform and solve a given problem. By controlling the simulated aircraft two students can indicate on the radar screen all the functions of an aircraft in flight. The other students act as controllers. One identifies the aircraft on the area surveillance screen and vectors the target to the final approach. A student on the flight data position keeps track of the aircraft being handled and their instructions. When in position for a final approach the student serving as the final controller accepts a handoff from the surveillance controller and talks the pilot to the runway.

If a student has trouble on a certain aspect of a previous exercise the computer memory banks can play back the exercise in its entirety, including the student's voice transmissions allowing him a self-critique and thus showing him where his problem lies.

The new radar target simulator will permit the Army to turn out controllers more adapted to the Army's equipment and requirements than ever before possible. This should save much time and money for the Army since the new controller will be prepared to step into an intensive OJT program and could be ready to be facility rated in the minimum time required.



These crash photos show what can happen when transmissions or main rotor blades penetrate the occupied portions of helicopters

SURVIVING THE SURVIVABLE

This article is based on a paper, "Analysis of U. S. Army Helicopter Accidents to Define Impact Injury Problems," which the author presented to the Aerospace Medical Panel Specialists Meeting held at Oporto, Portugal, 23-26 June 1971

OCCUPANTS sometimes do not survive survivable aircraft accidents. This appears paradoxical, yet a recent USABAAR study of 2,388 Army helicopter survivable accidents involving 10,599 occupants revealed that 439 occupants lost their lives. In fact, 40 percent of *all* Army aircraft accident fatalities occurred in survivable accidents.

For this study, an accident was classified as survivable if two conditions existed for at least one occupant. First, the impact forces on the occupant did not exceed the limits of human tolerance to abrupt decelerations and, second, the fuselage structural container maintained a livable volume around the occupant. In short, at least one occupant could have lived through the accident.

From this study, it is apparent that some survival problems can be solved. The very definition of a survivable accident points to the responsibil-

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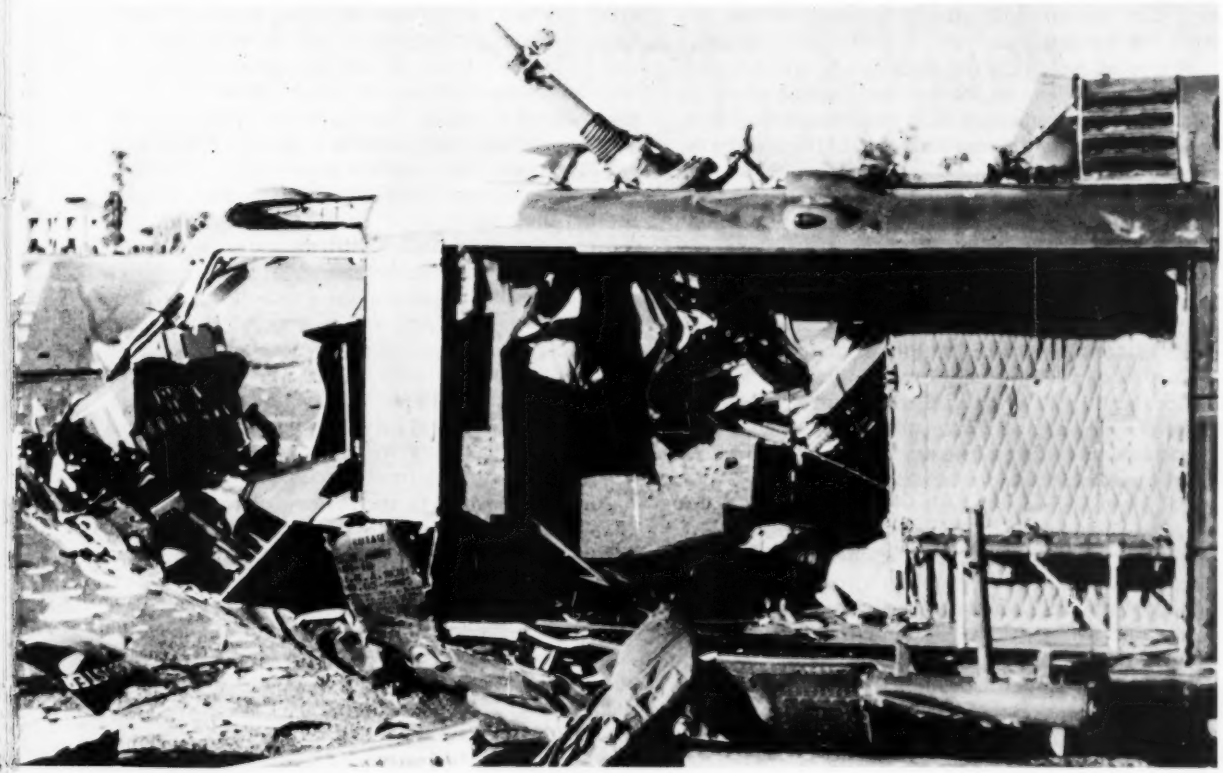

ity of the airframe designer to make the aircraft more crashworthy. A term not found in Webster's Third New International Dictionary, *crashworthy* means the capability of an aircraft to preserve life and prevent injury during a crash, while sustaining minimum damage. Responsibility does not stop with the designer. It is incumbent on aircraft crew members and passengers to take the measures necessary to increase their probability of survival.

We have two basic questions: How can the aircraft designer make the aircraft more crashworthy, and what must occupants do to help themselves live through accidents?

In this study, 33 light observation helicopter (LOH) accidents, 135 utility helicopter accidents and 17 cargo helicopter accidents were selected from the 2,388 survivable accidents to be examined in detail. These accidents involved moderate-to-severe impact forces. Injury causes and classifications were based on analyses by Army flight surgeons who investigated the accidents. Official photographs, onboard witness statements, wreckage distribution diagrams, crash sequence descriptions and occupant injury causes and descriptions were reviewed to determine kinematics (a branch of dynamics that deals with aspects of motion apart from considerations of mass and force) and structural deformation.

As accident details were analyzed, certain design considerations and occupant-controlled factors began to emerge which would help answer the two basic questions.

In the 152 cargo and utility helicopter accidents, the transmission penetrated the livable volume of the fuselage in one of every four cases, taking 20 lives. Main rotor blade penetration of livable volume resulted in six deaths. Plainly, some means

should be found to make the fuselage strong enough to sustain the downward loads caused by overhead masses acting on the structure during violent deceleration. At the same time, transmission tiedown strength should be increased to reduce the incidence of transmission displacement.

A related hazard is the occurrence of postcrash fires which seem to be in the cause-and-effect chain started by transmission displacement. These fires occurred in 9 percent of the LOH accidents, 33 percent of the utility accidents and 82 percent of the cargo accidents. In both the cargo and utility helicopter accidents studied, displaced transmissions provided many fire sources. Electrical wires, hydraulic lines and lubricating oil lines were severed with all too frequent disastrous results, especially in cargo helicopters. Fatal burns were sustained by three out of four fatalities which occurred in cargo helicopter accidents. Note: Additional study will be required to determine the underlying cause of the low number of postcrash fires in LOH accidents compared to those in other helicopter accidents.

All three types of helicopters tended to roll about their longitudinal axis in 47 to 69 percent of the 185 survivable accidents studied. This tendency poses a further problem for designers. In addition, a purely sideward impact was also found to be a significant kinematics item for each helicopter. The seemingly inherent tendency to roll, plus the high percentage of sideward impacts, indicates a need for crushable material to be used in fuselage sides and bellies, as well as a requirement for improved sideward restraint for occupants.

Occupant restraint, however, entails more than the provision of an adequate harness. People simply do not use the standard troop seatbelts because, many times, the belts become entangled because of their excess length and bulky adjustment hardware. This fact emphasizes the need for restraints which are more convenient to users. Restraints which could be fastened or unfastened in one or two seconds would answer the usual complaints and should make education about restraint use easier and more successful.

In addition to these design considerations, the study also revealed certain basic contributing factors over which occupants have some control. The 439 fatalities in the 2,388 survivable accidents could be attributed to three primary causes—fire, drowning and impact. Further examination of these fatalities revealed conditions which, if avoided, could increase the chances of living through a survivable accident.

Head and face injuries accounted for nearly one out of four impact and drowning fatalities. This large number of head injuries creates some doubt about the effectiveness of helmets. Helmets, however, are very effective when they remain in place. Unfortunately, they are quite likely to come off during even light-to-moderate impacts. This tendency is due in large part to loose fits or loose or unfastened straps. Poor fit can be the fault of a helmet. Some are more susceptible to being dislodged than others. This is for designers to correct. But wearers cannot ignore the fact that helmets cannot be expected to stay on and protect their heads when they refuse to either fasten or tighten the straps. Emergencies usually do not afford time to don helmets or fasten or tighten straps. To afford maximum protection, helmets must be properly fitted and worn at all times during flights.

Some helicopter crew members, in near-panic situations after crashes, are inclined to remove their helmets before they leave helicopters, thus exposing their heads to fire, fuel spray, jagged metal or still-turning rotor blades.

Another element in the history of head injuries is the lack of body restraint. In many instances, occupants of aircraft involved in accidents had not fastened their lap belts. When this occurs, they become flying missiles and their heads are highly vulnerable. The fact that two out of three persons aboard cargo helicopters and one out of seven utility helicopter occupants did not have their lap belts fastened during accidents constitutes a very real operational problem. A continuing program of intense education in the use of restraints is a must for all air crews and passengers.

In conclusion, we find at least a partial answer to the question dealing with the role of designers in protecting aircraft occupants in survivable accidents. They can increase the probability of survival by improving the tiedown strengths of transmissions and rotor masts, by designing fuselages which will not transmit forces to occupants in excess of human tolerance, by improving helmet retention and by simplifying the operation of restraint harnesses.

How can aircraft occupants help themselves to live through accidents? The answer lies in using good judgment and making the best use of protective equipment and restraints. Crew members and passengers who wear snugly fastened helmets and use restraint harnesses are more likely to survive survivable accidents.

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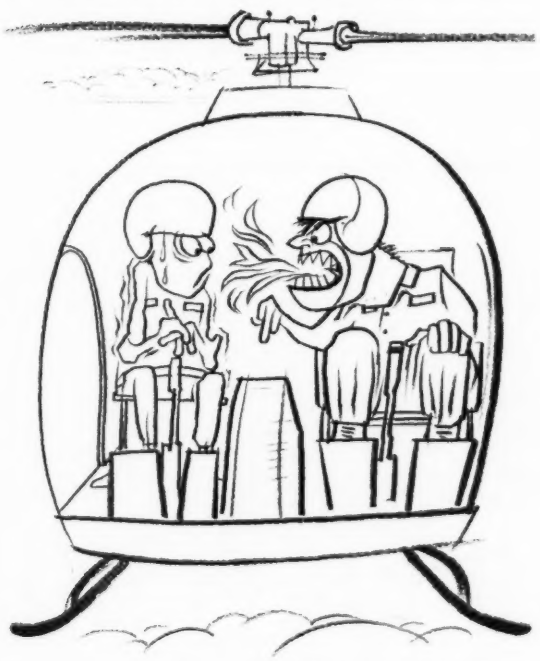
Listening Improves Vision

"GET YOUR HEAD out of the cockpit" are words familiar to everyone who has been a student helicopter pilot. He tries, but only moments later, the IP is tapping on the tachometer and calling his attention to the changing rpm's. While correcting this, the air speed and altitude change! Again, those familiar words, louder than before. The student is getting a good lesson in frustration!

Inability to efficiently divide attention between



cockpit duties and what is going on elsewhere is a major cause factor in any history of aircraft accidents. Most often involved are students and inexperienced pilots.

One reason experienced aviators are able to spend more time looking around and less time watching the instruments is their awareness of sounds produced by the aircraft. Their ability to hear, interpret and respond to changes in aircraft sounds is the additional means which they use to operate the aircraft. The capability of the aviator is extended by using his hearing to relieve part of the demand upon his vision. The amount of attention remains about the same, but the eyes are relieved of the responsibility of doing it all.

This flight technique is a self-acquired skill achieved by most aviators only after many hours of flying. Some aviators have only a subconscious awareness of these noises and attribute their ability to maintain rpm solely to the "seat of their pants."

Teaching this technique should be a part of all flight instruction. It should be made a teaching point in the earliest phases of flight training and emphasized as a part of every transition thereafter.

For example, the helicopter student must be taught that the tachometer is *not* the only source of information he can use to maintain rpm. He should learn to separate the sounds of the major components from the rest of the noise. He needs to be shown how to isolate the sounds of the engine, the transmission, the main rotor and tail rotors and proper responses to changes that occur during normal maneuvers.

Present flight instruction tends to be too demanding in the area of rpm control. Too many flight instructors insist upon *immediate* and *exact* rpm corrections. Maintaining rpm within safe operating limits by the use of aircraft sounds should be one of the teaching objectives.

A pilot who learns to initiate appropriate control changes in response to aircraft sounds will learn to fly in a shorter time. He will be able to devote more attention to the performance of the mission and less time watching the instruments.

Using this flight technique can reduce accidents caused by:

1. Tachometer and other instrument malfunctions.
2. Inadvertent loss or gain of operating rpm's.
3. Unusual or unexpected flight conditions.
4. Midair and obstacle collisions.

The addition of this flight technique will upgrade the quality of aviators and reduce accidents. In short, more aviators will have more time to see more!

What's needed to see and correct aviation unit deficiencies?

SUPER-VISION

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SOMETIMES I wonder just what part safety plays in the flying business. I have traveled to Korea, Vietnam, Germany and about 50 percent of the posts within CONUS as a member of a team presenting an Aviation Accident Prevention Course (AAPC). Every post has a different outlook on safety. Some are excellent while others leave a lot to be desired. Without using names, I will discuss two to prove my point.

Post X assigned a sergeant major as the contact officer for our team. When we arrived at the air terminal, the SGM was waiting with transportation for us and our equipment. We were taken to the classroom and given assistance in the preparation of handouts and equipment for the class to be conducted the following morning.

The next morning, we were taken to the classroom and began the course. There were approximately 30 aviators and 10 civilians from the fire department, post safety and post airfield attending the course. The post aviation officer attended about 90 percent of the course. Other duties prevented him from attending the remainder. We felt this class was one of the best motivated groups we had ever instructed. The accident and incident rate on this post was proof of the command attention placed on safety.

In contrast, let's look at post Y. When we arrived at the air terminal, there was no one to meet us. We proceeded to the post and it took the entire afternoon to locate the classroom and its key. The aviation officer was gone for the week and no one else knew what was going on. The majority of the aviators on this post did not know the course was being presented. Class attendance ranged from 13 to 24 aviators. Some of the students would only attend half a day. This post had approximately 270 aviators in category A and B assignments. As in the case of post X, post Y's accident rate also reflected the amount of com-

mand attention placed on safety.

These two posts are not exceptional. They are typical of posts throughout the world.

Why is there so much difference between post X and post Y? Is it because post Y commanders don't know or don't care? I can't believe they don't care. Therefore, they must be unaware of safety problems that exist within their commands. How do they find out? If they haven't been told by now, chances are they never will.

But there are ways commanders can get a better picture of the problem areas within their commands. How many senior commanders who are not rated have requested a briefing on aircraft capabilities and limitations, or simple *shoulds* or *should nots*? This type of briefing does not have to be a big formal affair. It can be given by the aviation safety officer or an instructor pilot.

If you are an aviation commander, have you ever told the operations officer to send Joe on a given mission and the operations officer replied, "Sir, I think we should send Bill"? Do you think he is trying to tell you something? Perhaps Joe is lacking in training or is not quite proficient enough to take that mission. You should find out why Joe shouldn't take that mission and see to it that his deficiencies are corrected.

Have you ever wondered why the pilots in a unit have a nickname for a certain pilot, such as "Shakey" or "Speedy"? You should try to find out. It could be that he's nervous or just plain reckless. Another type you should watch is the know-it-all, never-wrong pilot. The know-it-all often begins to feel he knows more than the people who built the aircraft and starts making his own performance charts.

We often hear people say, "I'm in the safety game." Safety is not a game. It's a business that requires constant attention and many long and tiring hours.

Take a look at your accident and incident statistics. Are you so proud of your safety record that you can't see the thin line that separates an accident from an incident? Usually, the same causes are listed for both. Your incident file is pretty fat, isn't it? This is a good indication that something is wrong. Take a look at all the additional duties you've given your aviation safety officer. It could be that he's only a part-time safety officer and safety is a full-time business. He hasn't had time to keep his records up to date and is unaware of the trend that has developed. Give him a hand. Review and update your SOPs, evaluate your current training program and beef up the weak areas.

Did you, as commander, ever wonder about the meaning of those long medical terms your flight surgeon uses in his reports? Your flight surgeon is human and has no immunity to complacency. He is often overworked and unable to spend as much time as he would like with each aviator. One of your pilots may have some borderline defect that should require him to be temporarily suspended from flying. If your flight surgeon has a mild case of complacency, he may feel that he's capable of detecting any change in the pilot. He may not see that pilot again until it's time for an autopsy. If you knew the meaning of those medical terms, coupled with your personal contact with pilots, you may be able to detect changes before the flight surgeon does. Bringing any such changes to the flight surgeon's attention could eliminate the necessity for autopsies. Talk with your flight sur-

geon and ask him about the meaning of the terms he uses or instruct him to use laymen's terms in his reports. Talk with him about each aviator.

The following Army aircraft accident investigation report is typical of many such reports on file at USABAAR:

An OH-6A took off with an IP and pilot aboard. It was a training mission and unfavorable wind conditions prevented practice autorotation maneuvers. The flight terminated at 1430, the helicopter was refueled, a different pilot was picked up and the IP took off again. The wind shifted, allowing autorotations. The IP demonstrated three basic straight-in autorotations and turned the controls over to the pilot to perform the same maneuver. The pilot entered the maneuver in the appropriate manner at the prescribed altitude and proceeded to execute what appeared to be a normal autorotation.

At approximately 15 feet, initial pitch was applied in an attempt to decrease the rate of descent. Collective was again applied at 8 to 10 feet. The helicopter fell from this altitude at an excessive rate and landed hard on the runway. On impact, the main rotor severed the tail boom. The IP was unaware of the tail boom loss and attempted to fly off the runway. As he applied power and increased collective, intending to hover, the helicopter spun violently to the right and he made an immediate hovering autorotation. The helicopter came to rest approximately 45 degrees to the right of its landing direction with major damage.

The accident investigation board questioned the aviators and examined all pertinent facts. This investigation was somewhat unusual in that the president of the board did not have the opportunity to examine the helicopter at the scene of the accident. Existing flight regulations state that only the president of the accident investigation board can release an aircraft from the scene of the accident. It is believed, in this case, that poor judgment, coupled with ignorance of the regulations, prevented a thorough investigation.

The reason given for removal of the helicopter was lack of security at the camp. The president did not agree with this reasoning because of the presence of friendly troops within the camp perimeter and the overall tactical situation of the area. A guard should have been placed at the scene to prevent looting and this would have adequately fulfilled the requirement.

In talking with the IP, the cause of the accident was easily determined by his own admission. To begin with, the syllabus of instruction was not followed, in that he was demonstrating autorotations, a maneuver not called for during the initial flight period.

The flight surgeon stated in his analysis: "This accident was probably caused by inexperience on the part of both the IP and pilot. However, I feel this unit has supervisory problems which, though not directly contributing to this particular accident, are reflective of problems I have previously seen in this unit. At that time the unit had poor supervision of flight records. This had not been rectified, as evidenced by the fact that the IP had flown in excess of 110 hours in 30 days without the required clearance of a flight surgeon.

"Secondly, during the previous observation it was noted that the unit did not have a preaccident plan. If one had been formulated, it was not implemented in this case. The flight surgeon was never called by a representative of the unit to conduct his part of the investigation. Also, this helicopter was removed from the accident site without inspection or approval of the investigation personnel. If accident investigation is to be meaningful to flight safety, these problems must be rectified. Both breaches of regulations may be indices of the quality of operations and supervision within the unit.

"A previous similar accident which occurred in this unit involved aviators who had not eaten breakfast or lunch, with resultant low blood sugar. There should be emphasis placed on nourishment requirements to raise air crews to optimum intellectual, judgmental and physical coordination status for safe effective aircraft operation. I feel this was a contributory cause of the accident and, parenthetically, is another example of poor personnel supervision."

"Established cause factors—operation: The IP failed to recognize an excessive collective pitch application, causing a critically low rotor rpm condition, and his subsequent corrective action was ineffective.

"Probable or suspected cause factors—training: The IP was conducting training with his first student since being awarded instructor pilot orders and his inexperience contributed to his slow reaction time and apparent unawareness of the situation.

"Recommendations: Increased emphasis on IP techniques, with particular attention to new instructors. The importance of following the course syllabus needs to be stressed to avoid exceeding student capability. A sound preaccident plan needs to be established to avoid any possible further violation of flight regulations and to aid in

expeditious accident reporting."

Reviewing official: "I concur in the findings and recommendations. A collateral investigation will not be conducted because this aircraft accident investigation was conducted in accordance with regulations and misconduct does not appear to be involved. The IP has been notified that he is suspended from flying temporarily and I recommend that he appear before a Flying Evaluation Board. I am taking this action because this is the first of two accidents (second accident occurred approximately 10 days after first accident) apparently resulting from the IP's poor judgment. The commander has read the aircraft accident investigation report and corrected all discrepancies in operational and administrative procedures identified in the investigation."

Take a look at the violations of regulations and procedures in this report and ask yourself if the same violations are occurring in your unit.

The first violation appears to have occurred when the IP allowed the pilot to perform an unauthorized maneuver during the first period of instruction. The flight syllabus did not call for practice autorotations during the first period.

The IP stated, "I attended an IP's briefing in regard to the syllabus of instruction for transitioning pilots in the OH-6A. I was told the syllabus was only a guide and we would not be expected to follow it explicitly." In view of this statement, shouldn't supervision share responsibility for the violation? If the IP had received more specific instructions, perhaps this accident could have been prevented.

The IP also stated, "Slow air speed and no cushioning pitch caused the aircraft to drop from 6 feet and we landed extremely hard. I rolled throttle on and was going to take the aircraft to the side of the active and shut it down to check it out for a hard landing." Supervision apparently had not placed enough emphasis on the dangers of flying an aircraft any distance after a hard landing without first having it thoroughly inspected by maintenance personnel.

Read the flight surgeon's analysis and recommendations again. He has pointed out several other violations that occurred. Each comment he made is a blast against supervision. Don't leave yourself open to blasts of this kind. Strengthen the weak areas in your supervision and make them blastproof.

A commander who can give a definite, unhesitating, affirmative answer to the following questions is on the right track to an effective accident prevention program.

1. Is your safety meeting a regularly scheduled event?

2. Do you attend and participate in safety meetings?

3. Do maintenance, airfield, control tower, POL and operations personnel, as well as aviators, attend safety meetings?

4. Is attendance mandatory?

5. Do your safety meetings stimulate interest in safety?

6. Is your aviation safety officer a fulltime ASO?

7. Have you appointed a responsible individual as safety representative in each functional area?

8. Is proper life support equipment available and used by all personnel?

9. Do pilots have full knowledge of their aircraft capabilities and limitations under all conditions?

10. Are pilots capable of analyzing inflight emergencies and initiating proper emergency procedures?

11. Are aircraft crews kept informed of all safety hazards in operational areas?

12. Are current wire maps available?

13. Is weather information in the AO accurate and, if not, are all pilots aware of this fact?

14. Are all maintenance personnel properly trained and supervised?

15. Are all maintenance functions performed entered on the proper record forms?

16. Are all inspections and services performed at required intervals?

17. Are all necessary precautions taken to prevent contamination of fuels and lubricants?

18. Are control tower personnel properly trained and is the control tower sufficiently equipped to provide communications and safe control of aircraft traffic under all conditions?

19. Are up-to-date TMs available to all personnel and used as required?

20. Are necessary controls in effect to provide maximum compliance and dissemination of safety information to all personnel?

As stated before, if a commander can answer all these questions with a definite YES, he is on the right track. Each commander should answer these questions and take the necessary corrective action where answers are negative. A safety-minded commander won't stop here. He will ask many more questions. When a commander has the initiative to do that, he is definitely in the safety business and his accident/incident record will reflect his professionalism.

PRO OR ARTIST?

PRESS THE accelerator and kick the speedometer up to 50. Gonna be another warm one. Through Daleville at five and into the air by six, right on schedule. Nice thing about the early flight is missing the 7:15 traffic jam. It's the only nice thing!

Just three studs to fly, so it won't be too bad. Should be home by two, time enough to get cracking on some Christmas shopping.

"The fastest, most reliable radio station in the Wiregrass—" Guess I'll have to take your word for it.

These kids today are doing okay. My three are no real pain, but they're out to get me the instant my mind wanders. Better stay on the ball.

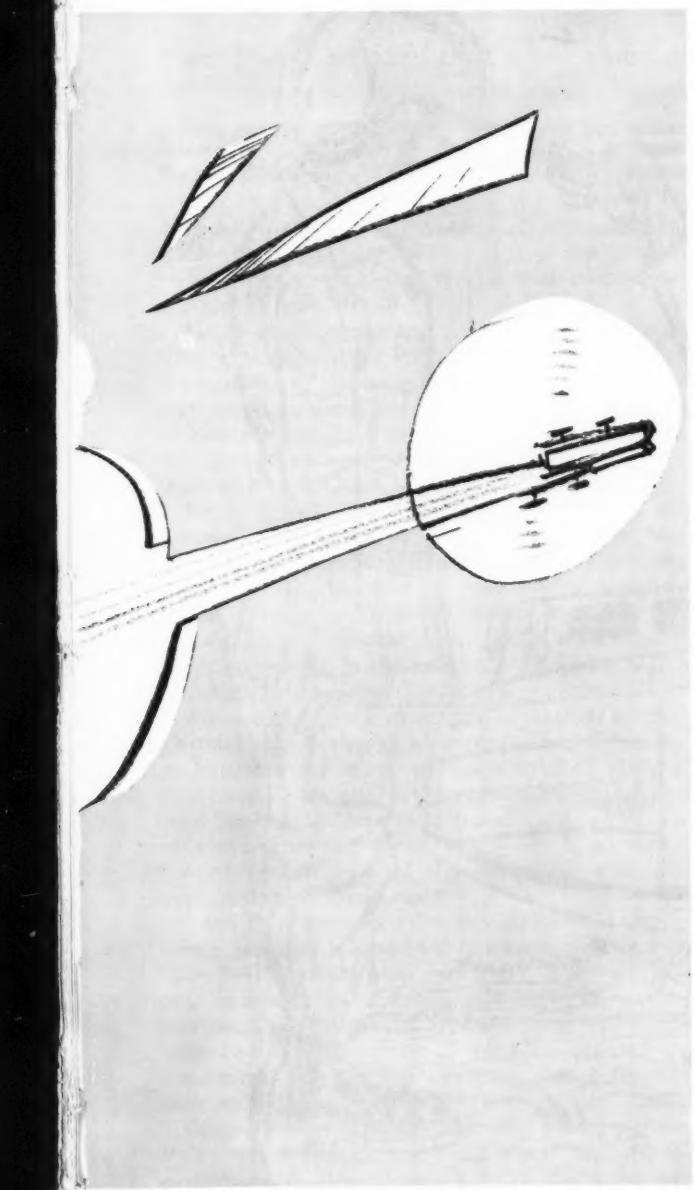
"Don't pour your love out on me, baby—" What's he mean?

Wonder how Swashplate Sam is doing? He was by far the best student I've had. Funny how I called him "Swashplate" right off. He had a control touch that made it seem as if he were moving the machine with a giant fingertip on the rotors.

It bothers me to finish some of these studs in the spring, knowing they've never had a real hot-weather heavy autorotation—I mean a *real* one like the Delta in August. No matter how much I talk myself blue in the face about DA, that first one's gonna be a surprise—a *real* surprise.

"Help me make it through the night—" You're through the night, friend, but the roosters' union will be after you.

Swashplate will do fine. He's more than a pro—he's a real artist. He had such a rapport with that pile of whirling aluminum that I swear I think it talked to him. It's sort of like a concert violinist tuning his Stradivarius. Saw Heifetz on TV, and Swashplate flies as easily as that guy plays Schubert. He worked at it, too, like Heifetz must have worked at playing that fiddle. Hours of solid practice, doing the same thing over and over again until it became second nature. Swash really laid into the books, too—the dash 10, flight regs, the whole nine yards. And he kept himself in good shape. I never had to sweat hangovers or lost sleep with Sam. Yep, he passed professional—all the way to being a true *artist*.



Pea River Pete

We're all professionals—by definition, if nothing else. But it was Swashplate who made me realize that "professional" is a wornout, overworked label. It's not good enough to describe the kind of aviator the Army needs—the kind who'll take every assignment in stride.

Take DA Dan, for instance. The "DA" doesn't stand for what he thinks it does. Sure, he was an IP, all right. He could recite the regs and give the best of briefings and debriefings. Only when the good Lord made DA, he left out the g meter. DA let his student make a hard autorotation touchdown, then tried to pick the thing up and hover to the grass. He totaled what had been only a broken driveshaft. DA had what is unfortunately a common feel for the airframe—he was always one nanosecond behind the bird. He was what I call a professional by definition only. He was no artist.

A fellow can be an artist without being different. An artist is only a person who, with a little talent, has carefully cultivated an exceptional rapport, feeling and understanding for the medium in which he chose to work. You can be an artist in music, painting, courtrooms, football, flying or even finances. (What my finances need is a full-fledged structural engineer!) The one thing all artists have in common is complete communication with and understanding of the tools of their trade and their limitations and capabilities—like that chopper talking to Swashplate. They understand what their tools say because of the many long hours of study and practice they've had in listening. When pilot artists operate, it's an exciting, satisfying extension of their senses and capabilities—beautiful to watch.

Swashplate will do all right, no matter how hot it gets.

If every Army aviator could and would pass beyond the pro stage and become a flying artist, everyone would be happier, particularly the people who fly with and depend on Army aviation.

"Do you know the way to San Jose?" Wonder if he gets paid for singing like that?

Into an open parking space—no problem at this hour. Look, my first stud's already at the bird. Whaddya know—Swashplate the Second!

Major Roy P. Hooks
Education and Prevention Department
USABAAR

"Nothing is so easy that it becomes difficult when approached with reluctance."
Terrence

SCRAPPED MISSION

MAJOR LACK O. Maintenance kicked the skid of his Huey a second time and asked in an anguished voice, "Where is that confounded ground element!?"

Major Maintenance had good reason to be mad. *That* ground element comprised his POL tankers, ammunition trucks, mess and supply trucks, as well as a maintenance element. Under command of Captain New N. Country, the executive officer, the ground element had departed base camp at 0800 with an ETA of 1000 at staging area Red.

Now, at 1230, Major Maintenance knew he was facing a bigger problem than a company of hungry aviators, crew chiefs and gunners. The escort ships had reported loss of radio contact with the ground element at 0900 and did not know the reason for their frequent stops. "Why do things always go wrong in the middle of the day with a relentless sun bearing down?" he growled.

Three miles south of staging area Red, Captain Country was having trouble controlling his temper as he discussed the situation with SSG Fully F. Frustrated, the motor sergeant. "A simple 25-mile road march, Sergeant Frustrated, and we've had nine breakdowns! We're 2½ hours late, with 3 miles to go! What kind of maintenance have you been pulling on these rigs?"

"Sir, I've been advising the major our maintenance program is inadequate. I know you've only been here 3 weeks, but you'll see. I haven't had any operator maintenance performed in over 2 months. They just drive 'em and park 'em. I only have two mechanics for 23 vehicles, plus all the generators. We just can't keep up with it the way they treat this equipment!"

Sergeant Frustrated stared at the young captain. "You might as well know the worst, sir. All the equipment in this company is in the same sad condition except, of course, the aircraft. The major says aircraft are his bread and butter and everything else comes second. Well, I'll tell you, those seconds haven't shown up yet! I sure hope he likes bread and butter. If we don't get some operator maintenance pretty soon, there's not going to be anything else in the pot."

"OK! OK, Sergeant! I see your point, but that's not getting us moving. Now, we have a troop lift at 1500. They need fuel and ammo before the lift and I'm sure they'd like a little chow. I aim on having this support element there in time to support them."

"With all respect, sir, if you'll just sit down in the shade over there, I'll have everything running as soon as possible."

Much to the relief of his crew chief, Major Maintenance had decided that kicking the skid again was not going to help. He had also thought about his last talk with SSG Frustrated. He remembered accusing the sergeant of exaggerating the condition of the unit's support equipment. But wouldn't it be ironic, he thought, if those trucks have broken down on the road and I have to inform the brigade commander that I can't support the mission—all for the lack of a few minutes a day operator maintenance and command interest?

Captain Country settled down under a stately oak and began to mull over the day's events, particularly Sergeant Frustrated's comments about the condition of the support equipment. Motor sergeants, he mused, just don't understand the problem. There just aren't enough people available in aviation units to serve as operators for all that support equipment! Then he remembered the words of the ancient philosopher, Terrence: "Nothing is so easy but that it becomes difficult when approached with reluctance."

SCRAPPED MISSION

Suddenly, the full impact of the importance of his responsibilities as the unit logistics readiness officer hit Captain Country. By cracky, I'm going to establish a program to ensure materiel readiness, he thought as he closed his eyes and drifted into oblivion. He began to dream . . . The first thing I'm going to do is make sure we have an officer on orders as maintenance officer. Then I'm going to ensure we have an adequate and current reference file. Of particular importance is the 750 series of Army regulations, since they cover the actions, operations, procedures and responsibilities necessary for an effective maintenance program.

Next, we have to develop a maintenance SOP. It must establish simple but effective policies and procedures—ones that we can and will adhere to—while incorporating policies and regulations of higher headquarters. DA Pamphlets 700-2 and 750-1 contain excellent guidelines for developing SOPs.

I'll be particularly interested in two parts of the SOP. First is the formal on-the-job training (OJT) program. It must provide for continuous training of MOS qualified personnel, as well as qualifying individuals for needed MOSs. AR 350-13, which establishes the requirement for OJT, and DA Pamphlet 750-1 will give me guidance for establishing an OJT program. OJT can't be accomplished by merely scheduling it as such, or by assigning a helper or trainee to work with an experienced mechanic. The program must be well organized, formal and flexible. It'll require the full support of the commander. I'll get him to read paragraph 1-16 of DA Pamphlet 750-1. That ought to convince him.

The other item of particular interest will be scheduled maintenance periods. Of all the maintenance pills, this seems to be the hardest one to swallow in aviation units. Most everyone agrees that good operator maintenance is essential for an effective maintenance program. What better way to obtain it than organized, supervised, scheduled maintenance periods?

What we have to do is develop a schedule that suits our particular situation. Maybe we'll perform maintenance on one-fifth of the equipment each day. That way, all equipment will get detailed operator maintenance weekly. Coupled with regular before, during and after operation maintenance, that should be enough to get the job done and take the minimum number of men away from their primary duty each day. And I'll consider other proposals.

The key to all this is command emphasis. I should get that because AR 11-14 directs commanders to provide sufficient prime military and civilian man-hours to perform required preventive maintenance services. It also requires commanders to conduct inspections to maintain an awareness of the actual condition of unit equipment. To help accomplish this, I think I'll recommend a readiness evaluation program to the battalion logistics readiness officer. I'm sure it can be performed best at that level. Here's what I'll propose:

READINESS EVALUATION

1. *Purpose:* To provide commanders with a continuous appraisal of the condition of unit equipment.

2. *Responsibilities:* Commanders are responsible for establishing priorities for the use of their available resources to improve logistics readiness. A proper balance must be maintained among operations, training, maintenance and other factors essential in attaining the optimum readiness condition.

3. *Implementation:* The battalion commander will appoint readiness evaluation teams for each commodity grouping. Commanders of personnel appointed to readiness evaluation teams will allow them adequate time to prepare inspection checklists, prepare for and conduct inspections.

4. *Scope:* Inspections of equipment and administration will cover the services, repairs and procedures as outlined in appropriate publications.

5. *Inspections:* The S-3 will publish items/areas to be inspected in the weekly training schedule. The goal is to inspect all equipment and administration once each quarter. Upon request from unit commanders, the teams will provide logistics assistance/instruction.

6. *Scoring:* Units will receive a satisfactory or unsatisfactory. A point system may be used to determine the rating.

Yes, Captain Country mused, if the old man will only support this program, we can—. He felt something shake him . . . Sergeant Frustrated shook him again. "Wake up, sir. We're ready to roll!"

Three miles ahead, Major Maintenance winced as the brigade commander began another tirade about having to scrap the mission.

Pea River Pete

Thoughts for the swivel chair warrior OR Assume Your Position

THE DEATH knoll has just sounded, or so it seems. Your assignment for the next 3 years is to pilot papers. For 8 hours a day you can look forward to taxiing your swiveling wheel chair into and out of a modified six-drawer casket. The whole idea is enough to make any tiger turn in his stripes! But it's really not all that bad. First, the job must be necessary or you can make a contribution by suggesting its elimination.

You're bound to make a contribution if you're half the tiger the Army thinks you are. One thing that will help you at your desk is to consider your body position. Psychologists have found a correlation between body positions and thought processes. These are basically three—standing, sitting and reclining.

A person is supposed to be more receptive to ideas and information in the sitting position. Consider, for example, a classroom or trustees' meeting. A person is supposed to have more creative ideas in the reclining position, a hard position to achieve at a desk, though some seem to manage. The last position is the one we are most concerned with for you as a decisionmaker. This is the standing position. The shrinks tell us decisions are easiest to make on your feet.

The evolution of this process can be seen as a correlation to evolution itself. Animals are the only class of living things that can relocate on the basis of their decisions. Even a number of quadrapeds stop and assume an upright position from which they can better decide which way to go. But only when man stood on his hind legs was this capability to relocate, or to implement decisions that we had rather be in some other place, fully exploited.

Good management encourages decisionmakers to get out on their feet for a few hours a week, realizing from experience that this position is beneficial to their work, regardless of the activity.

Lawyers who must make razor-sharp conclusions affecting lives and imprisonment plead their cases standing up. What would you think if your defense attorney sat down to argue the facts? People with problems go for long walks. Helmsmen who must keep their ships on course regardless of the wind make their decisions on their feet. Chariot drivers with slashing knives on their wheels stood at the reins. If cockpit sizes and restraint mechanisms ever permit, we may find aviators fly better if they are less folded over.

In summary, when you find yourself assigned to a desk job, remember the positions most conducive to your work. Stand up! Get off your swivel! Make better decisions!

AVIATION ACCIDENT
PREVENTION
FORUM

an interchange of ideas between readers and USABAAR on subjects of aviation accident prevention

Crew Member Responsibility

Request information, clarification and reference to the following question. In case of an aircraft accident, who would be charged with the accident in the following three situations:

1. Aircraft commander and instructor pilot (not logging IP time).

2. Aircraft commander with 6 months' experience and senior aviator.

3. Commissioned officer with 1 year experience and warrant officer with 6 years' experience.

The preceding question was brought to my attention by our standardization section. I reviewed AR 95-2, paragraph 2-1, and was unable to come up with a correct answer for these questions.

Fortunately, no accidents have occurred under these or any other situations. However, clarification may enlighten our operations section as to crew assignments and the responsibilities placed upon individual aviators in case of an incident or accident.—CW3, ASO

You use the word "charged" which, in itself, is not clear. The word "charged" may mean:

1. A cause of the accident.

2. Blamed for the accident by collateral investigation under AR 15-6 which may result in charges under the UCMJ or a claims investigation.

Assuming that negligence is not involved, definition 2 above can be eliminated and definition 1 can be applied to the three hypothetical situations you submitted. The references for the answers are AR 95-2, paragraph 2-1, Command of Aircraft, and AR 95-5, paragraph 13-4f(5), Cause Factors-Operation.

1. Aircraft commander and instructor pilot (not logging IP time): If the IP is not functioning as an IP he is, in this case, subject to the authority of the AC who is in command of the aircraft and responsible for its technical operation. Either or both of these individuals could cause an accident should one occur.

2. Aircraft commander with 6 months' experience and senior aviator: Generally the same situation as above. AR 95-2 is very explicit in this area. The AC is in command of the aircraft and responsible for its technical operation. The AC will have final authority as to the technical operation of the aircraft. Either or both of these individuals could cause an accident should one occur.

3. Commissioned officer with 1 year experience and warrant officer with 6 years' experience: The assumption is made that the positions concerned with are pilot and copilot. AR 95-2 states that the pilot will command the aircraft and be responsible for its technical operation. In the absence of an AC the pilot has the same responsibilities as an AC were one on board. Rank, years

of experience, or anything else has nothing to do with who is in command of the aircraft. The aviator filling the pilot position is in command of the aircraft. Either or both of these individuals could cause an accident should one occur.

While it is easy to determine who was in command of an aircraft at the time of an accident, determining what or who caused the accident is a more complex matter. Determining the cause of the accident is one of the functions of the accident investigation board. A separate and impartial investigation is made of each separate accident to determine the cause.

In the event of an accident, all crew members will have an entry made in their flight records to reflect that fact.

Shatterproof Sunglasses

In the past 2 years I have heard an increasing concern over the issue of sunglasses that aviators are wearing and the fact they are not shatterproof. I dropped my pair on a concrete floor, they landed on the top rims and both lenses shattered. We are told to fly with these sunglasses on and to use the clear visor, but if a bird were struck or an accident occurred and the shield penetrated or flexed enough, the sunglasses would do irreparable damage to the eyes. I heard of an experimental pair of sunglasses in a plastic frame that were shatterproof and being test worn, but since this is only a test, and over a year long, it doesn't solve the problem.

The optical shop on post advised me the cost for hardened lenses for my issued frames would be $10 to $12. The lab charges him 50 cents to harden them. Since it is apparent that hardened lenses are available, and are cheaper by volume, as the Army would order them, why aren't shatterproof sunglasses issued to Army aviators and crews?—CPT, aviator

According to the United States Army Aeromedical Research Laboratory (USAARL), lenses in military glasses issued after 1 January 1972 will be temper hardened. Since this action will not be effective until the first of the year, it will be some time before a sufficient quantity of lenses is on hand for issue to all aviation crew members.

Cash Facts Addressees

Request clarification of paragraph 4-2d, AR 385-40 (Change 2).

Is the intent of the regulation for each unit to notify the other services, or is the reporting to be as it has been in the past—that USABAAR notifies the other services?

This information is to be passed on to the aviation safety officers in this command.—President, Aviation Safety and Standardization Board

Readers are invited to participate in this forum. Send your ideas, comments and recommendations to Director, USABAAR, ATTN: E&P Department, Ft. Rucker, Al. 36360

The unit submitting a crash facts message should include as addressees the other military services of the United States if the aircraft involved in the accident is common to the other service(s).

Hot Refueling

USABAAR has been queried several times recently about where hot refueling procedures may be found. Change 6 to TM 10-1101, dated 20 March 1969, is devoted entirely to "rapid refueling operations [which] provide for the safe and expeditious refueling of Army helicopters at a multipoint refueling area without shutting down the aircraft engine." Change 6 includes a list of refueling and safety equipment, diagrams showing refueling-point spacing and aircraft position, proper refueling procedures and personnel responsibilities. USABAAR considers that hot refueling should be restricted solely to combat operations because of its inherently hazardous nature.

David T. Forbes Jr. *Aircraft Accident Analysis and Investigation Department, USABAAR*

WHAT IS FLICKER VERTIGO?

MANY ARTICLES have been written about flicker vertigo (FV) and it has been described in many ways. Before attempting to define FV, it should be noted that it applies to many environments, i.e., aviation, TV, auto, train, etc. Our primary interest is aviation safety, so we will concentrate on FV as it relates to aviators, more specifically to rotary wing aviators.

Flicker is defined as an unsteady waver, flutter, movement in a quick glancing manner, fitful burning or fluctuating light. Vertigo is defined as a disordered state in which an individual or his environs appear to whirl dizzily, or a dizzy confused state of mind. One medical dictionary cites vertigo as dizziness, especially the feeling that the surroundings are whirling.

Another authority states: "Vertigo and pilot vertigo are, in flying parlance, essentially synonymous with spatial disorientation. Although medical use of the word vertigo usually connotes sensations of actual spinning, most pilots take it to mean confusion about spatial orientation, whether experiencing a spinning sensation or not. . . ."

Still another source states: "The word itself is hard to define. To earthbound individuals, it usually means dizziness. To a pilot, it means, in simple terms, that he doesn't know which end is up."

Pilots use the term vertigo in referring to many types of confusion with respect to attitude and motion during flight. Vertigo has come to denote almost any type of experience in flight which does not correspond to actual events.

The reason for this belabored explanation of the term vertigo is that flicker vertigo may be a misnomer. Vertigo, in pilot talk, usually refers to a confusion about spatial orientation. Flicker vertigo should have a more definitive name, such as photic stimulation, photic activation, photic hypnosis, psychogenic flicker, sensory disorientation, flick psychosis, etc.

What causes FV? The environment is the key. An environment which produces a situation of flickering light at frequencies from 4 to 30 flashes per second (FPS) can cause FV.

What effect does FV have on aviators? It can produce unpleasant and dangerous reactions in some people. These reactions may include nausea, dizziness, grogginess, drowsiness, unconsciousness, daze, disorientation, headaches, confusion or even reactions similar to epileptic seizures. The reaction of most concern to aviators would be one producing convulsions. FV has also been described in terms of uneasiness, nervousness, hypnosis, gastrointestinal discomfort and a feeling of severe panic. You need not be a qualified aviator to understand that panic is a most undesirable state for a pilot at the controls of an aircraft. Following are some case histories which may better explain the effects of FV on aviators:

Case 1:

The pilot woke up at 0200 after 2 hours of restless, noise-disturbed sleep aboard his aircraft. As he awoke, he saw that the copilot's head was thrown back and making a jerky side-to-side movement. A crewman summoned to the cockpit restrained the copilot as he went into convulsions and grabbed at the controls. He lapsed into convulsive leg and arm movements, striking the pedals and cyclic control. The fact that his shoulder harness and lap belt were secured prevented completely uncontrollable activity during his seizure. Nevertheless, the pilot had considerable difficulty maintaining control.

The copilot lost consciousness for the next 10 minutes, during which his convulsive activity waxed and waned. At one point, the crewman tried to check the copilot's tongue to make sure he could breathe, but he could not open his mouth because his jaw muscles were contracted. After landing, the copilot again reached for the controls and had to be restrained. With the aid of a crash crew he was forcibly removed from the cockpit through the emergency exit and taken to the dispensary.

On arrival at the dispensary, the copilot was dazed, groggy and disoriented. A neurological evaluation was made and his electroencephalogram (brain wave pattern) was normal until photic (light) stimulation at 10 to 12 FPS was attempted. At this time, seizure activity was noted and the procedure stopped.

Case 2:

While on a southbound morning flight along the coast, a crewman who was sitting in the copilot's seat of an SH-34J convulsed with generalized movements of his arms and legs. During his muscle spasms, he pushed uncontrollably on all flight controls. The pilot had extreme difficulty controlling the helicopter and at times came within 4 feet of the water. The flight surgeon reported the crewman was totally disoriented, ataxic (uncoordinated), sweating profusely and complaining of severe headache. His confusion lasted approximately 1 hour. The crewman had only 3 hours sleep the night before because of a change of shift and his early arousal for the flight.

Case 3:

After a helicopter had been airborne for about 10 minutes, the pilot began to feel sleepy, suddenly lost consciousness and had a convulsion. He later reported, "All I could see was a bright flicker of the sun through the rotor blades."

Case 4:

A B-36 tail gunner, while scanning the engines, last remembered seeing the sun through the slowly turning propeller blades. He had a grand mal convulsion. This man had never had a previous seizure.

Case 5:

While standing on the ramp waiting for an incoming C-54 to shut down, a pilot serving as airdrome officer noted the rays of the setting sun through the revolving propellers and had a grand mal convulsion on the ramp.

Case 6:

A pilot reported: "In solid stratus with light to moderate rain, I decided I'd take time to turn on the windshield wipers just before intercepting the outbound radial. If you've never used them in the SH-3A, I can tell you they actually bump the front end of the aircraft. While I never noticed them to be particularly distracting in VFR

weather and had never used them in IFR weather, I was suddenly aware that I could hear them bumping and feel them in the seat of my pants. My scan was peripherally catching the bottom inch or so of the blades. I paid little attention to them until I rolled out inbound and started my descent. Then I was struck with the worst case of vertigo I've ever had. I found myself forcing the VGI to stay level and every time the wipers thumped, I'd swear I was kicked another 10 degrees off course to starboard. It got progressively worse to the point where my rate of descent became erratic due to my fixation on the VGI. Things felt mighty hairy between 1,200 and 800 feet."

Case 7:

A recent case of flicker vertigo was caused by sun reflection from a vibrating masonite hood installed in an aircraft for instrument practice. The pilot reported there was no appreciable time element involved. As soon as the aircraft was headed in a direction where light produced flicker, it caused an immediate attack of vertigo. As soon as the pilot recognized this condition as vertigo, he concentrated on the instruments and was able to read them, although they appeared to be floating in the air. He found that he could stop and start the vertigo by holding the hood piece tight against the aircraft structure to stop the vibration.

Case 8:

After flying for some time at an altitude of 16,400 feet, a pilot in a single-seater propeller aircraft made a perfect landing. However, he did not taxi the plane to the hangar. Instead, the plane remained motionless, its propeller revolving slowly. The pilot was found bent over the controls, unconscious. At first, it appeared he had not used his oxygen mask. However, in this case, the pilot had lapsed into unconsciousness only after making a good landing. The rays of the low-lying sun were shining on the slowly turning propeller blades. Reflected flashes of light were being thrown on the pilot's face at a rhythmic rate of about 12 flashes per second.

Case 9:

"Flying a Culver Cadet, I was approaching to land at a small field. My approach was directly into the setting sun. During the latter part of the approach, I very nearly passed out and felt a general wave of nausea. I was able to land, but while taxiing further down the runway, I still felt an impending sickness. It only stopped when I turned away from my westerly heading."

It has been noted that the Germans used a variation of flicker vertigo during World War II when their searchlights were deliberately arranged to flicker in order to irritate attacking pilots. The worst frequency for this searchlight flicker was found to be between 4 and 12 cycles per second.

Do certain frequencies produce different reactions? Yes, one source reports a critical frequency range of 9 to 15 FPS for producing subjective sensations. Another indicates that the phenomena of flashing lights having physiological effects are not limited to the FV concept. The frequency of 6 to 8 FPS has been reported as producing an out-of-phase response of the iris and optic nerve, resulting in loss of depth perception. This source also reports that 25 FPS interferes with alpha waves in the brain. This affects the ability to concentrate.

An article on eyes cautions pilots about using polarized sunglasses in aircraft with electrically heated windshields. It seems there is a possibility of FV resulting from light waves generated by the electrically heated windshield and filtering through polarized sunglasses at the correct frequency for photic stimulation.

Is the probability of FV exposure greater in rotary wing aircraft? Yes, although fixed wing aviators may be exposed to FV. The probability of their exposure in contrast to helicopter pilots is less. The fixed wing pilot is exposed only in limited situations (i.e., windshield wipers, slowly turning propeller, anticollision light in restricted visibility, etc.). Rotor blades passing over the cockpit subject rotary wing pilots to a constant situation of light being flicked by the passing blades. Flight into or away from a rising or setting sun may exaggerate this condition. Comparing the 4 to 30 FPS FV frequency range to the helicopter environment, we find that most helicopters are FV inducers.

Are there any helicopters which are not FV inducers? Perhaps the OH-6 and Soviet Mil V-12 are exceptions because the pilots are out from under the rotating blades or outside the frequency range. This does not mean that FV exposure can't happen in these two helicopters, because there are many FV inducers. Following is a partial list of potential inducers:

1. Rotor blade passing over cockpit
2. Slowly revolving propeller
3. A functioning anticollision light
4. Position lights on flash

5. Perceiving strobe light
6. Operating windshield wiper blades
7. A vibrating instrument hood
8. Doctored searchlight
9. Polarized sunglasses and electrically heated windshield
10. Others—Nonaviation
    Laboratory photic stimulation
    Fence post flashing by
    Television

Now that we have described and discussed flicker vertigo and its results, the question is, what can we do about it?

Can we redesign the environment? No, it's impractical to redesign helicopters where cockpits are remote from rotor blades or to reengineer rotor aerodynamics outside critical frequencies.

Can we adapt pilots? One authority says, "Adaptation does not appear to be a significant factor. Many of our pilots, especially those with little helicopter experience, reported they had no experience with flicker, thus no opportunity to adapt. Research and clinical findings indicate that, while the abnormal EEG response to flicker may not appear on each examination, adaptation does not occur."

Can we screen our pilots through photic stimulation and EEG examination? It has been established that persons with epilepsy are susceptible to flicker vertigo. Photic stimulation can activate this condition and an EEG can record it. It has been recommended that all pilot trainees be examined for sensitivity to flickering light. It has also been stated that the current status of such methods warrants a strong recommendation for recording EEG's on all aviation candidates. While it might not be desirable to use available EEG criteria for negative selection of aviators, in the absence of supporting clinical evidence, one authority stated: "Though photic stimulation does not appear to be useful as a screening technique for latent seizure disorders, it does appear to have value in identifying those who find flicker irritating, annoying or confusing. It also identifies a group of pilots in whom flicker produces a lowered state of vigilance. These findings suggest that if photic stimulation is going to be used to screen pilots who may show EEG abnormalities or sensitivity during flicker, this screening should be done earlier, perhaps before any flight training in helicopters."

Can we condition the pilot? Education appears to be the solution—education about the FV phenomena and conditions leading to it. Fatigue is directly correlated to FV. Fatigue and frustration tend to increase the annoying quality of flicker and its manifestations appear to be even more pronounced. We can educate our pilots and supervisors about the dangers of fatigue and frustration.

Low g tolerance seems to suggest a greater susceptibility to FV, as well as hypoxia, hyperventilation and hypoglycemia. We can warn our pilots about the insidious somnolence (sleep-inducing) and hypnotic effects of FV. Performance appears not to be affected by photic stimulation when a pilot's attention is deliberately focused on his task. Can pilots physically offset FV? One suggestion is to shield the eyes. Research suggests that merely closing the eyes does not reduce photic stimulation. Shielding the eyes and other protection measures could take the form of:

1. Turning the helicopter to a point where sunlight does not flicker through the blades.
2. Turning off anticollision lights.
3. Switching position lights to STEADY.
4. Going to 100 percent oxygen to prevent or reduce hypoxia.
5. Eating appropriately to prevent hypoglycemia.
6. Removing a vibrating instrument hood.
7. Removing polarized sunglasses.
8. Changing and varying rpm to break the photic stimulation pattern.

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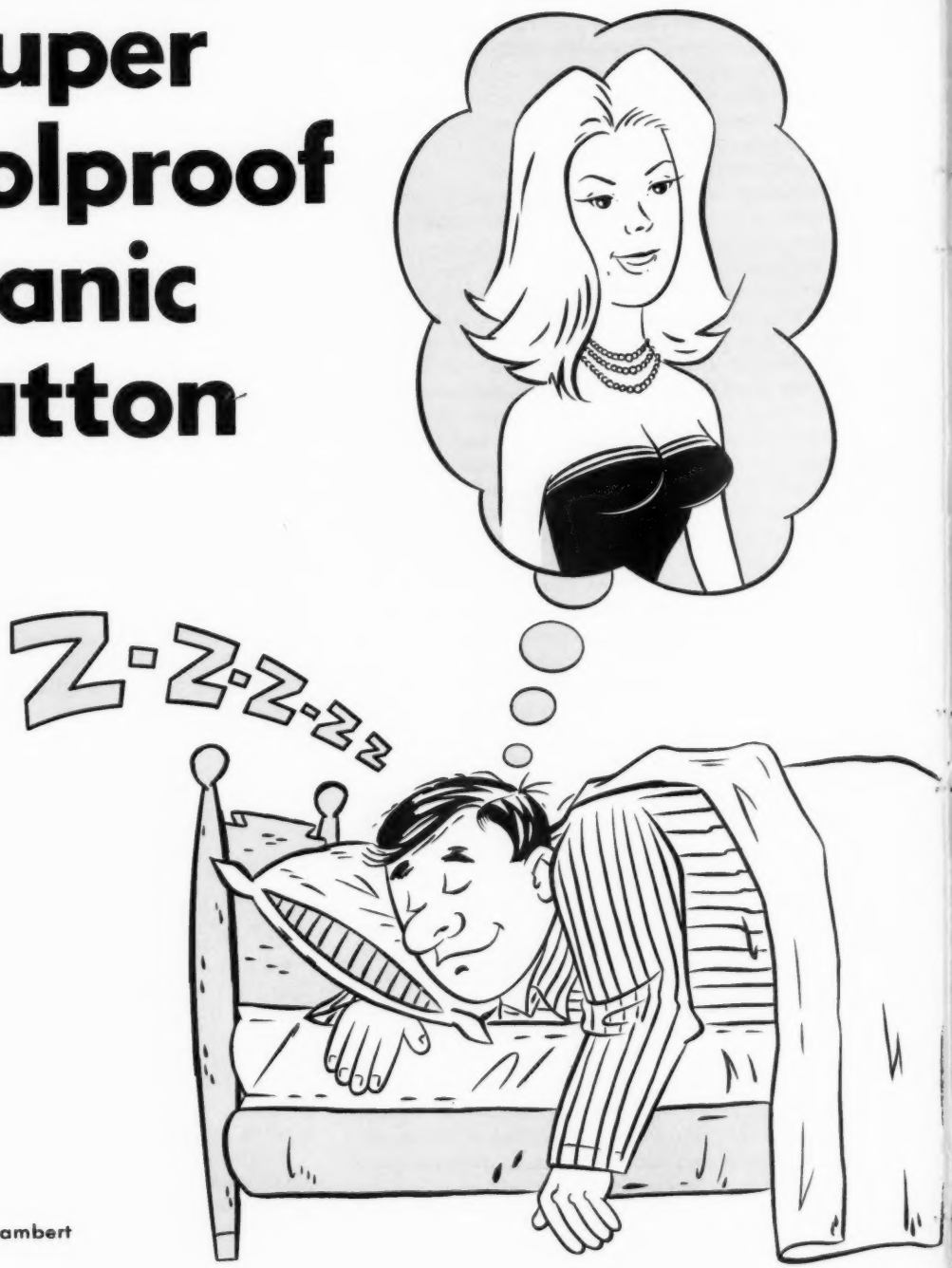
Super Foolproof Panic Button



Arnold R. Lambert

IT WAS 6 o'clock and I had just reached the end of an interesting dream in living color when the ding-a-ling clock went off. Being the perfect husband I am, I scrambled out of bed and turned the alarm off before it could wake the war department. Besides, she might not be too happy if she knew she hadn't played a role in my dream.

I plodded to the kitchen, plugged the coffee pot in and stared at what looked as though it would be another sunshiny day in Alabama. Scratching and yawning, I retraced my steps, tiptoed past my sleeping wife and entered the bathroom, closing the door quietly behind me. In the stinging shower spray, I came awake and felt like singing, but restrained the impulse. She's not always in the best of moods when her sleep is interrupted, especially by my off-key warbling. I finished my shower, shaved, dressed quietly, downed a quick cup of coffee, patted the pooch on the head and was on my way to work.

School buses were already on the roads collecting youngsters. I turned onto county road 59 and stopped for one that was loading. Facing the driver, I grinned and waved. He looked at me, as if to say, "What are you, some kind of nut?" Then I remembered he wasn't in my dream either.

I arrived at my desk, had another cup of coffee and thought about what I could write to promote aviation safety. As I was smoking and sipping, a redheaded steno walked into my cubicle and handed me a stack of current aircraft accident reports. I admired her new hairdo as she walked away, then turned back to the reports.

I read through each report, looking for good examples with impact and teaching points. I didn't find anything outstanding. They were all repeats of the same song, same verse. Looking primarily at the findings, I made some mental notes and had just finished the last report when the blond typist from the next cubicle walked in. She said she was swamped with typing and wanted to know if there was any rush on an article about supervision. After this pleasant interruption, she returned to her desk and I returned to the reports.

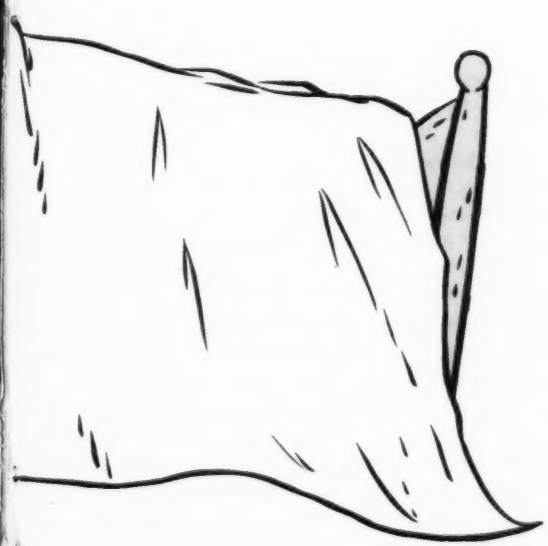
Joggling my mental notes, I thumbed through the reports again and found that the majority listed *operation* as the established cause factor, with *training* or *supervision* listed as probable or suspected factor. This was when I decided what to write about.

As a member of a flight crew, you face more danger than anyone else connected with aviation, so your concern for safety should be the greatest. This would be my topic. Many articles have been written about every aspect of aviation safety, including operations, maintenance, weather, supervision, FOD and many more. In spite of these, accidents continue to happen. What can *you* do about it?

A crew should be more than just a crew. It should be a team striving for two goals—mission accomplishment and survival. An alert team can do a great deal toward attaining both before it leaves the ground. Ask yourself who pays for maintenance mistakes not detected during inspections. It's the same guy who pays for your new car and your wife's fur coat—YOU. But the payment you make for a maintenance mistake is often far greater than those for the car and coat. If this seems unfair, why not take some action to avoid this third payment?

If you discover a maintenance mistake during your preflight, do you write it up and report it to the maintenance officer? It may be that the mechanic and maintenance inspector need more training or closer supervision. If so, you'll be doing them and yourself a favor by reporting their shortcomings where they can be corrected.

This type of action shouldn't be restricted to



FOOLPROOF PANIC BUTTON

mistakes you find during preflights. It should apply to all areas. Tell your aviation safety officer about the leaky refueling nozzle in POL, the conex too close to a'revetment and the cowboy who races his LOH through a congested area. Tell him these conditions are potential threats against your life.

Is your crew just a crew or is it a team? It should be a team of professionals, each with a full knowledge of specific duties and the ability to perform those duties in any situation. Each crew member is a vital part of this team. During emergencies, your AC will have his hands full and need all the help he can get. A team of professionals will instinctively help him to analyze the problem, monitor instrument readings, make necessary radio transmissions, etc. The following emergency should have resulted in a successful forced landing. Lack of teamwork turned it into a tragedy.

A UH-1 with a crew of five was cleared to land and the pilot started a descending right turn to base. At approximately 400 feet, with an air speed of 60 knots, a loud screeching noise was heard from what appeared to be the engine section. The helicopter yawed right 10 to 15 degrees, then streamlined. The pilot felt that control responses remained normal, but relinquished control to the AC.

The AC started a precautionary landing and the tower was advised. As his air speed dissipated to approximately 40 to 45 knots on approach, the UH-1 began an accelerating right turn, then entered a flat spin to the right. Attempts to regain air speed were futile and the tower was notified they were going to crash.

The tower operator saw the helicopter impact in the spin. Crew statements indicated it hit first on its left front side and rolled at least two times before coming to rest inverted. Four of the crew members, who sustained only minor injuries, exited and began searching for the fifth crew member. He was found under the wreckage, still secured to the airframe by his monkey harness. It was evident he had died instantly. The helicopter was a total loss.

Evidence indicated failure of the number one hanger bearing, with resultant separation of the tail rotor driveshaft at that point. The bearing showed visible signs of excessive heat. The balls were deformed and fused and the splined shaft and couplers were stripped. These findings, along with the circumferential marks found on the forward shaft assembly and fire shield, indicated inflight failure.

Records showed maintenance was performed on the hanger assemblies 6 days before the accident. Minor in nature, the maintenance consisted of a washer restack and was not considered significant. Historical records revealed the number one hanger bearing had been used 402 hours, 202 of which were on this helicopter. The etched serial number on the bearing housing taken from the wreckage did not correspond with data recorded on DA Form 2408-16. However, the data plate was not on the bearing and could not be located. It's possible the intense heat generated by the bearing failure resulted in separation and loss of the data plate. The bearing was submitted with an emergency EIR for laboratory analysis and historical research.

Investigation board analysis: "Analysis of all available evidence indicated the number one hanger bearing seized, resulting in driveshaft separation at the coupler, with resultant loss of tail rotor thrust. The aircraft commander failed to analyze the inflight failure and chose to make a precautionary landing immediately, rather than continue the flight to the airfield and make a running landing. Contributing to the failure to quickly analyze the malfunction was the transfer of control from pilot to aircraft commander without comment and without benefit of the pilot's analysis of their condition before allowing the aircraft to enter a nonrecoverable flight envelope. There was no concrete evidence indicating maintenance or inspection error. However, this must be considered, pending laboratory analysis and historical research of the defective hanger bearing."

Established cause factors were:

Materiel failure of number one hanger bearing, with subsequent separation of the tail rotor driveshaft.

Failure of the aircraft commander to initiate proper emergency procedures when loss of antitorque thrust was experienced.

Failure of the pilot to communicate his analysis of the inflight malfunction in time to allow the aircraft commander to take the proper action.

Probable or suspected factors included:

Crew teamwork was not evidenced in analyzing the inflight malfunction.

Maintenance and inspection, pending laboratory analysis.

It's obvious this crew was not a team. Their lack of teamwork and communication contributed to a major accident which should have been, at most, an incident.

While materiel failure was listed as an established factor, the possibility of this failure being maintenance induced could not be ruled out. There are two kinds of bearings used in UH-1 tail rotor driveshaft hanger assemblies. One is a sealed bearing, requiring no lubrication. The other is lubricated with a needle. If a sealed bearing is punctured with a needle, it can ruin the seal and cause the bearing to fail. Details on how to distinguish between these bearings, to lubricate or not to lubricate, as well as safety precautions which should be taken, can be found in PS magazine, Issue 225, August 1971, page 52. Ask your maintenance officer if he has seen this and passed it on to the mechanics and inspectors.

Now, back to my dream. In it, I was single (most married men seem to prefer this status for dreaming) and having a few cool ones in a local lounge. It was getting late so I finished my drink, said good night to the bartender and started to leave when the door opened and in walked the most beautiful girl I had ever seen. I quickly decided to stay because the only available seat, recently vacated by a man with whom I had swapped lies, was at the bar next to me.

I ordered another drink and, sure enough, she sat down beside me. She was receptive to my admiring smile and accepted my offer to buy her a drink. As we talked, I sensed a high degree of intelligence in addition to everything else she had going for her. A few drinks later, I slugged the juke box and asked her to dance. She melted her body into my arms and followed my lead with the grace of a swan. Afterwards, we returned to the bar and continued to talk. The next thing I knew, the bartender was shouting, "Last call!" With little persuasion on my part, we agreed to continue our conversation in her apartment. As you can well imagine, my male ego was considerably inflated.

When we arrived at her place, she put on a stack of records, kicked her shoes off, fixed us a drink and excused herself, saying "I'll just slip into something more comfortable."

I assumed I was in for a pleasant evening. I sat down, kicked my shoes off and loosened my tie. All sorts of visions went through my head about what "something more comfortable" would turn out to be. Finally, the door opened and there she stood. At the same time, her front door opened and a man walked in. It was the same man who had been sitting beside me at the bar. I didn't know whether to grab my shoes and run or try to melt through the sofa.

She said, "I'd like you to meet my husband."

With a sheepish grin, he apologized for the sneaky way I had been lured to their apartment. I asked, "Why me?"

He explained that during our conversation I said something about being an aviation writer and he needed my help tonight. Tomorrow would be too late. He hadn't thought he'd be able to persuade me to come to their apartment, but was sure his wife could. My ego dropped sharply and I wasn't too happy with his trickery, but I decided to listen to what he had to say, since he had gone to so much trouble to get me there.

He explained he was a design engineer and worked for an aircraft manufacturer in research and development. He claimed he had developed an absolute foolproof aircraft and crew saver system. He called it a "super foolproof panic button" and said it was adaptable to any aircraft and would work at any altitude in any flight situation. He insisted all emergency procedures could be forgotten with this button installed. He explained that all pilots would have to do to cope with emergencies would be to push the button and relax with arms folded while floating gently and safely to earth.

He said his system had been tested twice and two aircraft lost, the first caused by a mechanic named Murphy Slaw installing the button wrong. He claimed the possibility of this happening again had been eliminated. The second loss occurred when a pilot kicked the button through the instrument panel, causing it to malfunction.

My host explained he was an engineer and not a writer, but that he had written a 47-page procedure about how the panic button should be pushed. He informed me they were testing again tomorrow and wanted me to review what he had written. He wanted to be sure the pilot would clearly understand what he must and must not do.

We went over the entire procedure. I made a few suggestions and assured him that everything was clear enough for anyone to understand. He was shaking my hand and thanking me when the alarm clock shattered my dream.

I wish I could remember the details of how that super foolproof panic button works. Unfortunately, though, I'm a writer and not an engineer. Until my friend comes out of fantasy land with a working model of his invention, I'm afraid you'll have to rely on the professional team concept to keep you out of trouble and rescue you when emergencies rear their ugly heads. Meantime, I'm off for a nap to try and recapture my dream.

TIME TO GO!

from February 1971 AEROSPACE SAFETY

The troops who beat the bushes for better and more efficient ejection systems scratch their heads when statistics show no improvement in survival rates . . .

ONLY YOU can make the decision. Only you can design mechanisms within yourself to trigger an automatic sequence that will propel your body from the warm, comfortable atmosphere of your cockpit. How and when you elect to activate this sequence will remain a function of what has transpired until that time when something inside you says—EJECT! Whether the ejection occurs at 20,000 in controlled flight or at 100 feet, outside of the envelope, the decision will have been made, not necessarily then but sometime in the past—perhaps without your knowledge.

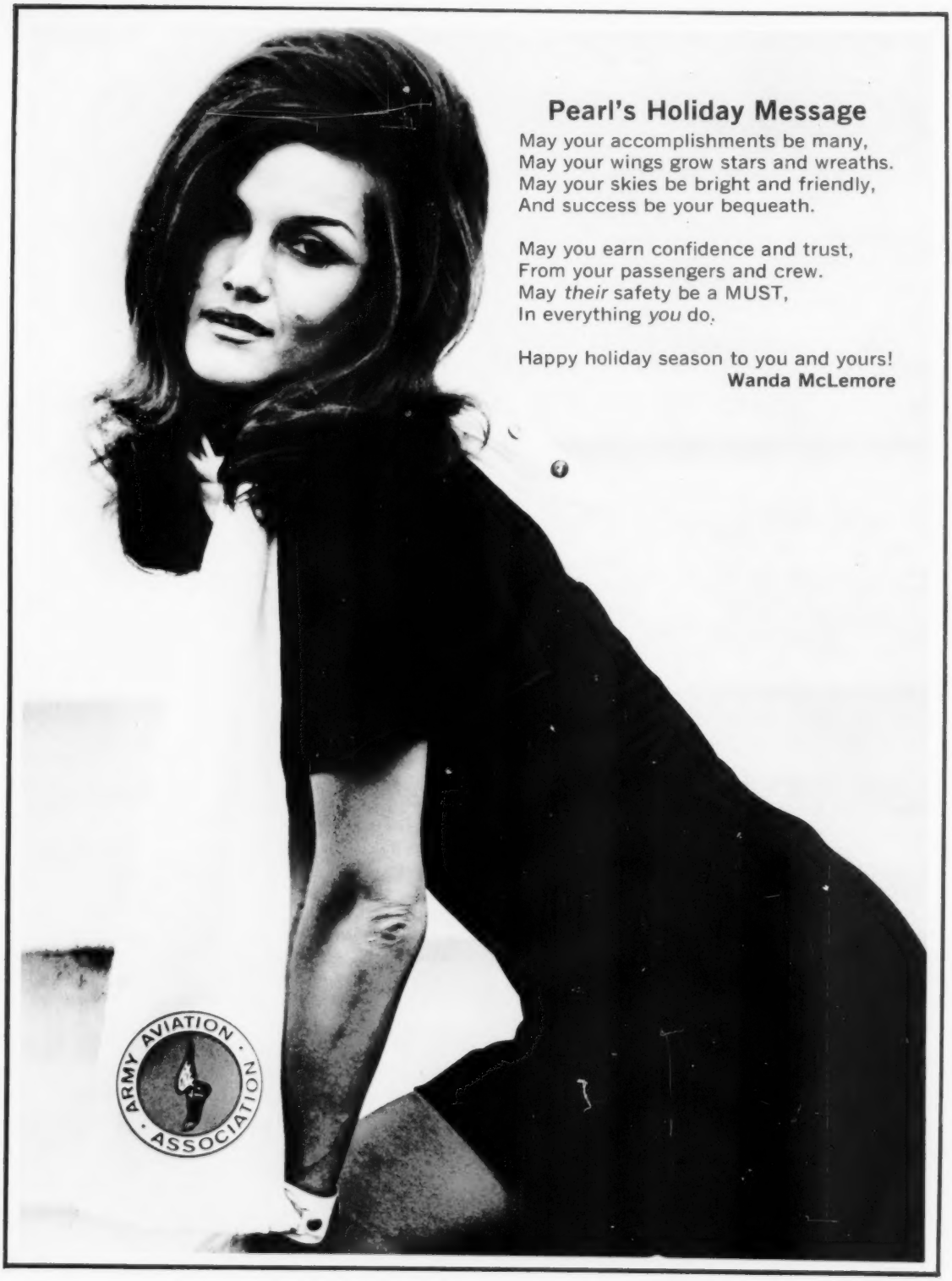
We have to face certain things if we are to fly today's high performance aircraft, or any aircraft for that matter. One of those unpleasant facts is that, no matter how good we are with the stick and rudder, there may come a time when we are no longer master of our aircraft and are simply a passenger. When this occurs, whether we ride it in or elect to eject makes no difference to the fate of the bird. If it's doomed so are you, if you elect to remain a passenger.

The decision to eject has never been a very popular one, especially for the guy who has to reach down, pull the handle and admit that he has washed his hands of the whole unpleasant matter. When a pilot does this he has said to himself "I can't hack it anymore; it's too much for me." For any self-respecting pilot it's a difficult pill to swallow. What really bothers us is the fact that we might, just might, be wrong. Perhaps there is something else that could have been done to save the airplane. But one thing for sure, if his decision to stay with the bird is wrong, he's dead wrong.

There's an old axiom that says "Buddy, when it comes time to step over the side, you'll know it." This is true. The catch is to recognize THE TIME early enough to make the decision. Two jocks faced this problem when their T-33 flamed out at 20,000. Both agreed to jump at 8,000 if they were still in the weather. No change at eight; they were still in the weather, with no airstart, but decided to hold on down to 6,000 and so on down to 2,000 where, still in weather, with a dead engine the rear seat pilot ejected. The pilot in the front tried to go but the system refused to cooperate. He rode it in to his death. Had they stuck to the original decision *both* pilots might be alive. The pilot in front would have had time to at least give it a try over the side—it's been done before.

The troops who beat the bushes for better and more efficient ejection systems scratch their heads when the statistics show no improvement in survival rates, although our systems are better than ever. A possible answer is the *"since the system is better, I can stay with it longer"* syndrome. It seems like a wise move for every pilot to take a critical look at the ejection envelope for his particular aircraft. Does it take into consideration bank angles, yaw or roll rates? How about dive angles? Make certain you know all the capabilities of the system.

Aside from the ostrich pilot who refuses to admit that the decision will ever confront him is the jock who, while in the companionship of his


Pearl's Holiday Message
May your accomplishments be many,
May your wings grow stars and wreaths.
May your skies be bright and friendly,
And success be your bequeath.
May you earn confidence and trust,
From your passengers and crew.
May *their* safety be a MUST,
In everything *you* do.
Happy holiday season to you and yours!
Wanda McLemore
ARMY AVIATION ASSOCIATION

TIME TO GO! continued from page 61

hangar flying buddies, makes such off-the-cuff predicisions as, *"I don't know of any airplane that's worth killing myself for,"* or *"I'm sticking by the dash one, when 15,000 shows and I'm still out of control, I'm leaving,"* or maybe *"If things don't look real good at high key, adios."* Have you heard these gems? Maybe you've said them yourself. I had a friend who made those remarks, but, while dead-sticking an '86, wrapped it up in a ball of flame short of the runway after he admitted over the radio at low key that things didn't look right to him. Why did he stay with it? He sensed the aircraft was doomed. Everyone on the ground recognized his peril and advised him to get out—yet he's dead.

We have the statement of one pilot who delayed but made it. *"Because of an innate fear of meeting accident investigation boards and FEBs I decided to make one effort to recover."* Was he subconsciously aware that the airplane was going to crash in spite of what he could do, yet had to give it one more chance? Fortunately he ejected in time. The harness he shed after getting on the ground was found between the two halves of the seat. He knew it was a desperate situation before he tried "once more." He knew the odds were against him.

Do you know of an accident board that chastised a pilot for leaving an airplane "when the odds were against him?" You may, but I don't. Pilots have ejected prematurely, at least that's the decision made by judges who sort through the facts after an accident. Quite possibly, those pilots who sit in judgment could have saved the machine, but then, on the other hand, could it be that the pilot who ejected early would have been doomed, along with his aircraft if he had attempted to salvage a desperate situation? The task may have been beyond his capabilities and so, in reality, the ejection was not premature from the point of view of this pilot's flying ability. When you lose your cool, chances are you are staring disaster in the face. The TIME for one pilot may not be the TIME for another in terms of proficiency.

Perhaps you've heard the story about one of our more illustrious pilots who, when faced with a flameout at 30,000 and no restart, calmly requested a GCA because the weather was barely above minimums. At the completion of his dead-stick GCA the only comment was that the final controller's corrections were too large. I, personally, feel that such skill (or luck) is beyond most of us and I would have ejected. Only you can make such a decision.

Fortunately the picture is not at all bleak. There is a low premium insurance policy available to all of us: *Know your equipment and know your limitations.* One has a definite effect on the other. The more familiar you become with your machine the more confidence you gain in your ability to cope with a sticky problem. If you have the feeling that the situation is out of hand you can bet your last dollar (you might as well) it is. Don't let pride take you down the drain. Believe it or not, some situations ARE beyond anyone's control. The ones that really give us trouble are the borderline cases. If the engine blows and the aircraft is engulfed in flame there is no doubt about what to do. But if it flames out at altitude with a fair chance of gliding to a runway we very possibly will give it a go. This is the kind of emergency that demands we know our bird. How far will it glide? Is the weather good enough to attempt a flameout landing? Is the runway long enough? And, most important, if things don't look good have we established an altitude for leaving the machine? In many instances, ejections that occur outside the capability of the system didn't have to happen. The pilot put himself there by delaying his decision to eject.

We're going to lose some pilots in 1971. The cause will be stated simply: "The pilot delayed his decision to eject until successful operation of the ejection sequence was impossible." This implies several conclusions, most important of which is that it was possible for the pilot to have ejected within the safe envelope.

The intent of this article is not to encourage you to fly with one hand on the ejection handle. Far from it. We must do everything possible to get our sick bird back on the ground in one piece. However, we have had enough sacrificial attempts to save an obviously hopeless situation, with the result that both pilot and aircraft were lost. An aircraft is replaceable—you are not—not to the Air Force, not to your wife, not to your children or to your parents. Don't let your final thought be "I've stayed with the aircraft too long" and become a 1971 statistic.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Overhauling your GCA

Availability of revised AR 95-37

Keeping your console clean

Where's My GCA? You ATC maintenance types have probably heard that question a dozen times while your GCA has been at the depot for overhaul. And you've wondered why it took so long to get it back—that guy at USAASO said it would take only 45 days and that ran out 3 weeks ago. Boy! If the operations officer asks one more time!

Well, now, let me tell you how to make it easy on yourself. First of all, remember you are asking the depot to *overhaul* the GCA—not make a new one. So, be sure to inventory the set and ship a *complete* GCA to the depot—all that good stuff like cables, actuators and covers has to be fabricated locally if you forget to ship it! Secondly, keep in mind that you are shipping a very fragile piece of equipment and that it has to be packed and crated properly. You can help the depot to help you by remembering these two points, and you can keep that ops officer off your back too!

Keep Der Konsole Kleen: Mud or java—Kohee or mocha—coffee by whatever name you might call it—a cup of joe is frequently the one thing a controller will call for to soothe his frayed nerves and bring some order to his world. It's just something for you to relax with for a few minutes—only to be jolted out of your reverie by an urgent call from an aircraft. In jumping up you knock over your coffee and it sloshes all over the console, running down, into, onto, over, around and under all those relays, switches, condensers, diodes, tubes, wires and all that stuff that makes up the guts of your console. Maybe you're lucky and everything continues to work, but all that coffee, sugar, cream and whatever dries up and builds up as this situation occurs again and again during the years. It doesn't take much of this type of treatment and your trusty console becomes an old, antiquated piece of junk. There are all sorts of adages about keeping your "equipment" clean and functioning properly, but probably as good as any is: "Der koffee in der radio makes it kaput." Please don't set your coffee, Coke, Mountain Dew or tea on the console. Your maintenance man has enough problems!

AR 95-37: In November we told you about it and now it's out—the revised AR 95-37, dated 15 September 1971, with an effective date of 15 November 1971. Get your copy. ATC chiefs should take particular notice of paragraph 1-56.

CORRECTION! In our July "USAASO Sez" item on ATC tips, we advocated using Dupont's #630 silicone to coat the dome or the antenna horn. It should have been DOW CORNING #630 silicone.

Gunship Prototype Presented To Museum

THE SIOUX SCOUT pictured above is now on permanent display at the U. S. Army Aviation Museum at Ft. Rucker, Ala. The Scout was a prototype designed and demonstrated by the Bell Helicopter Company during the early 1960s to establish some of the concepts required of an armed aerial fire support system. It featured a narrow, streamlined fuselage to provide minimum drag and tandem seating for the pilot and gunner providing maximum visibility. Some of the same characteristics incorporated into rotary winged attack aircraft such as the Cobra, Cheyenne and Blackhawk.

Photo left: BG William J. Maddox Jr., Director of Army Aviation, accepts the Sioux Scout in ceremonies at Fort Worth recently. From left are Mr. Hans Weischel, Bell vice-president for marketing and logistics; GEN Maddox; Mr. E. J. Ducayet, Bell president; and COL E. W. Fletcher, deputy commander at Ft. Rucker.

The museum displays are open to the public from 0900 to 1600 hours weekdays and from 1300 to 1700 weekends and holidays.

Gene Berta

From crash facts messages, with apologies to Mother Goose or whoever . . .

TEN LITTLE HELICOPTERS

Ten little helicopters all in a line;
One flew into weather—
Then there were nine.

Nine little helicopters taking off late;
One was tied down—
Then there were eight.

Eight little helicopters with engines revving;
One loose oil filter—
Then there were seven.

Seven little helicopters getting in their licks;
One chafed line—
Then there were six.

Six little helicopters ready to drive;
One skid caught PSP—
Then there were five.

Five little helicopters beginning to soar;
One unfastened hatch—
Then there were four.

Four little helicopters in an LZ;
One tree strike—
Then there were three.

Three little helicopters with a job to do;
One unfilled tank—
Then there were two.

Two little helicopters with a mission to run;
One dirty spark plug—
Then there was one.

One little helicopter with its job almost done;
Flew into wires—
So then there was none.